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ON
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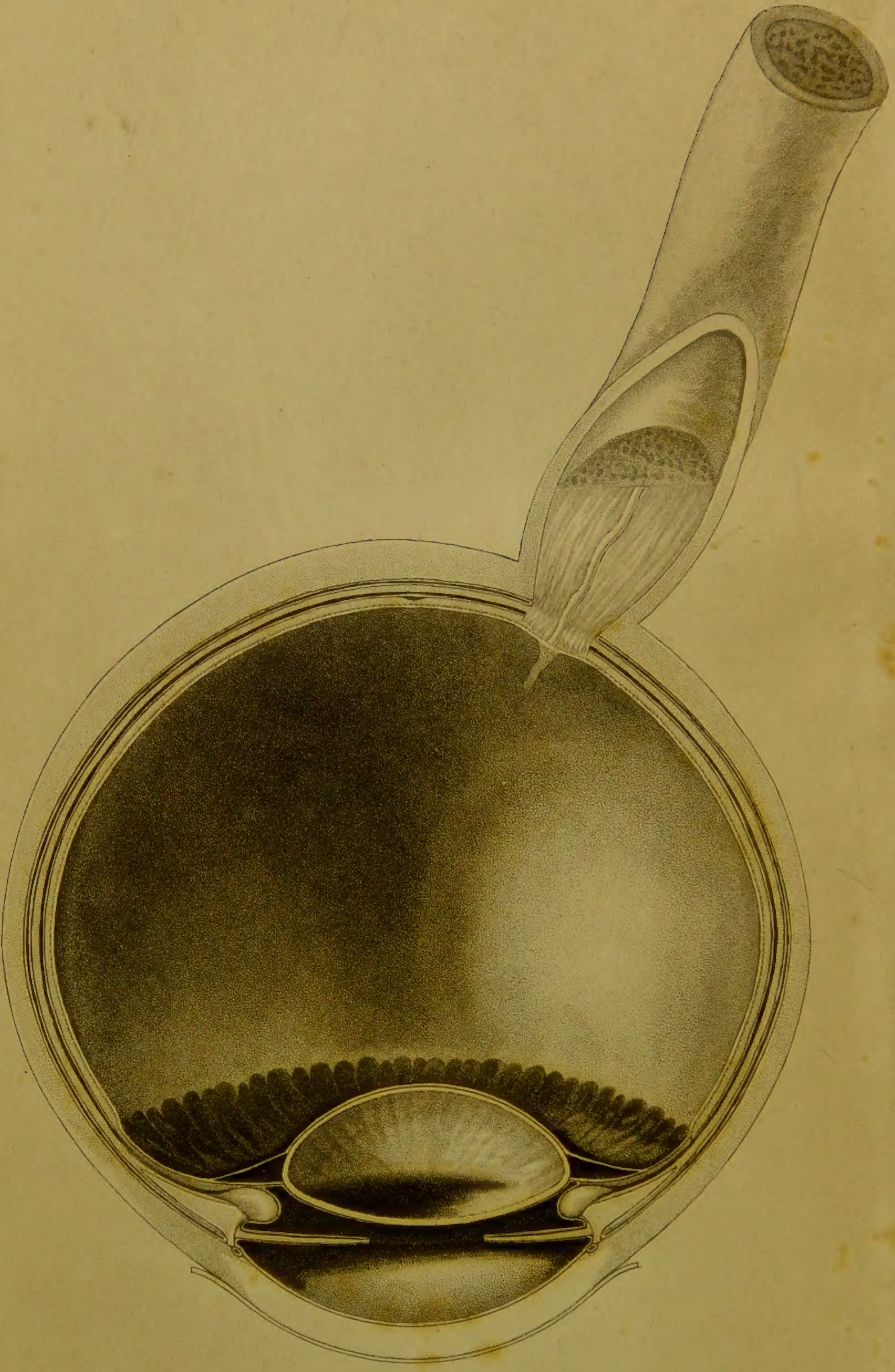

HORIZONTAL SECTION OF THE RIGHT HUMAN EYE.

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A
PRACTICAL TREATISE

ON THE

DISEASES OF THE EYE.

BY

WILLIAM MACKENZIE, M.D.

SURGEON OCULIST IN SCOTLAND IN ORDINARY TO HER MAJESTY, LECTURER ON THE EYE IN THE UNIVERSITY OF GLASGOW, AND ONE OF THE SURGEONS TO THE GLASGOW EYE INFIRMARY.

TO WHICH IS PREFIXED

AN ANATOMICAL INTRODUCTION EXPLANATORY OF A HORIZONTAL SECTION OF THE HUMAN EYEBALL,

BY

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PROFESSOR OF OPHTHALMIC MEDICINE AND SURGERY IN UNIVERSITY COLLEGE, LONDON, AND OPHTHALMIC SURGEON TO THE HOSPITAL.

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TO

THE FOURTH EDITION.

In the present edition, a large amount of new matter has been added, and an attempt made, as far as the author's opportunities have served, to notice every material advance in the pathology and treatment of the diseases of the eye, which has been made during the last fourteen years.

For most of the additional wood-cuts with which the work is now illustrated, the author has been indebted to Dr. John Ritchie Brown.

In the present edition, care has been taken to introduce, under each head, the most remarkable synonymes; and to give references to the works where the best figures of each disease may be found. The following is a list of the authors chiefly referred to, for such illustrations:—

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To the author of a treatise on a professional subject, involving the minute observation and description of a particular class of diseases, it must afford no small gratification that three large editions of the original work have been exhausted; that it has been reproduced by a transatlantic press; and has been deemed worthy of being translated and published in the three best known languages of modern Europe, German, French, and Italian. Such an unexpected reception affords assurance that the labour of many years has not been altogether misspent.

To the translation of this work into French by MM. Laugier and Richelot, from which the Italian translation has been made, it is necessary particularly to refer, on account of what must be regarded as an act of injustice to the numerous authorities referred to in the work, as well as to the readers of the French and Italian translations, and to the author himself. The translation of MM. Laugier and Richelot is executed with great care and success; but the bibliographical references are entirely omitted. By this means, the reader is prevented from referring to the proper authorities for many of the facts stated; the original authors who have recorded many of these facts are deprived of the share of credit which is justly due to them; and it may happen that many things may be credited to the author of these pages, by the French and Italian readers, which in the original English work are faithfully ascribed to those from whose works the facts have been taken.

Glasgow, 27th September, 1854.

CANCELLED

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ANATOMICAL INTRODUCTION,

EXPLANATORY OF A

HORIZONTAL SECTION OF THE HUMAN EYEBALL.

BY THOMAS WHARTON JONES, F.R.S.

⁂ The Numbers (1.) (2.) (3.) &c. refer to the horizontal section, Plate I.

The human eyeball is nearly spherical in form. The antero-posterior diameter or axis (*a b*, *Fig. i.*) and the transverse diameter (*c d*), both measured from the outside, are about equal; their average length being $\frac{19}{20}$ths of an English inch.

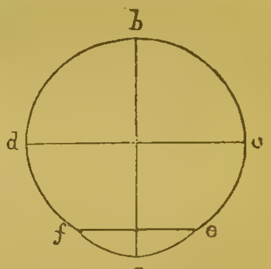


Fig. i.

The strong outer tunic of the eyeball consists of the *sclerotica*, which is opaque, and the *cornea*, which is transparent. Though the surfaces of these two parts are not strictly spherical, it may be allowable to state, in a general way, that the sclerotica is a large segment of a larger sphere, and the cornea a small segment of a smaller sphere. The diameter of the sclerotic sphere, is the same as that above mentioned of the eyeball as a whole. The radius of the convexity of the cornea is about $\frac{13}{40}$ths of an inch. In order to meet each other, the sclerotica, at the line of junction, bends slightly towards the axis of the eyeball; the cornea, in an opposite direction (*e f*).

The eyeball consists of four classes of parts :—1st. The protective parts, or tunics. 2nd. Parts subsidiary to the perfection of the eye, as an optical instrument; *viz.* the iris, which is a diaphragm for correcting the aberration of sphericity, and the dark pigment, which serves to absorb the rays of light. 3rd. The especially sensitive parts ; *viz.* the optic nerve and the retina. 4th. The dioptric parts, refractive media, or lenses.

I. Protective Parts or Tunics of the Eyeball.

In a horizontal section of the eyeball, $\frac{5}{6}$ths of the circumference are formed by the *sclerotica* (1.), and the remaining sixth by the *cornea* (4.).

Sclerotica.

The sclerotica is a strong, dense, white, fibrous membrane. Posteriorly, and to the nasal side of the axis of the eyeball, it is perforated by the optic nerve (17.), and is there continuous with the sheath (2.) which that nerve derives from the dura mater. Near the entrance of the optic nerve the sclerotica is about $\frac{1}{20}$th of an inch in thickness; from this it diminishes to about $\frac{1}{40}$th of an inch, but becomes a little thicker again in front, where it is reinforced by the tendinous insertions of the straight muscles. The texture of the sclerotica consists of an interlacement of longitudinal and transverse fibres of the same nature as those of tendon. The sclerotica is penetrated by small orifices, for the passage of blood-vessels into or from the interior of the eye. Like most other fibrous structures, however, it is itself but little vascular. Its scanty capillary network is fed principally from the ciliary and muscular arteries. Nerves have not been unequivocally traced into its substance, but many pass through it on their way to the interior parts.

Cornea.

The *cornea* (4.), at once a part of the outer tunic of the eyeball and of the dioptric apparatus, appears to the naked eye as if framed into the sclerotica, in the manner represented in the section. The diameter of the cornea measures about $\frac{9}{20}$ths of an inch (*e f, Fig. i.*): but this, the transverse diameter, is a little longer than the vertical; because, in consequence of the encroachment of the sclerotica externally on the upper and lower edges, the circumference of the cornea appears actually oval, its small end being towards the temple. Viewed from the inside, the circumference of the cornea is more nearly circular. The cornea is about $\frac{1}{30}$th of an inch thick in mature age; in early life, however, it is somewhat thicker, and in old age thinner.

The cornea comprises three principal layers:—1st. The *proper corneal substance* in the middle (4.). 2nd. The *conjunctiva corneæ* in front (4′.). 3rd. The *membrane of Descemet* behind (6.).

The proper substance constitutes the principal thickness of the cornea. Microscopical examination shows it to consist of stratified bundles of fibres. There is, however, no natural separation into distinct layers. It is through the medium of the proper substance, that the cornea is joined to the sclerotica. The fibres of the two structures interlace, or are continuous with each other.

At its surfaces, which are invested respectively by the conjunctiva corneæ and membrane of Descemet, the proper substance of the cornea is smooth, and of a close texture, but can scarcely be said to be formed of distinct membranes.

Conjunctiva corneæ, the substance which is made to peel off from the anterior surface of the cornea, by the action of boiling water, &c., and at the same time rendered opaque, is merely stratified, tessellated epithelium. This is continuous with the epithelium of the sclerotic conjunctiva, and is the sole constituent of most part of the conjunctiva corneæ; the cellulo-vascular basis of the sclerotic conjunctiva extending only a little way over the margin of the cornea.

The *membrane of Descemet* (6.) lines the whole posterior surface of the cornea. When peeled off with a fine forceps, the fragment curls forwards into a roll. Spread out and examined under the microscope, it appears a homogeneous transparent substance, invested on its posterior surface with a single layer of tessellated epithelium.

Except in the early stage of development, no blood-vessels are visible in the cornea beyond its margin. The nutritive plasma with which the interstices of the cornea are filled, is received by transudation from the blood circulating in the vessels of the neighbouring parts. In inflammation, however, the cornea may become vascular from the development of new vessels. In this case, the vessels of the conjunctiva corneæ are continuous with those of the sclerotic conjunctiva, while the vessels in the proper substance appear to be fed from the minute vessels, which are at the same time seen forming the pink-coloured zone of the sclerotica around the cornea.

Branches of the ciliary nerves are distributed to the cornea.

Choroid.

The choroid coat (7.), situated within the sclerotica, is a membrane composed chiefly of blood-vessels and pigment cells. The arteries are the *short* or *posterior* ciliaries, twenty or thirty in number, which enter the eye through the sclerotica, near the optic nerve. The veins, called, from the peculiarity of their course, *vasa vorticosa,* gather chiefly into four trunks, which pass out through the sclerotica midway between the cornea and optic nerve, and at equal distances all round. The capillary network, which is very close, is disposed on the inner surface of the choroid. The arteries, therefore, enter it from without inwards, whilst the veins proceed from it in the opposite direction.

The ciliary nerves, which pierce the sclerotica behind, pass forward between the latter and the choroid, on their way to the annulus albidus and iris.

Towards the place where the sclerotica joins the cornea, the choroid coat, for the breadth of about $\frac{1}{4}$th of an inch on the temporal side of the eyeball, but less on the nasal side, presents a peculiar plicated structure internally. The folds, seventy in number, and called *ciliary processes,* are little elevated posteriorly (10′.), but very prominent anteriorly (10.). They are extremely vascular, and are supplied from the same sources as the choroid.

This plicated anterior part of the choroid is called *ciliary body* (10. 10′.). Externally, it is encircled by a band of grayish white tissue, named *annulus albidus* (8.), about $\frac{1}{8}$th of an inch broad, thick anteriorly and thin posteriorly, a process of which (*ciliary ligament* (9.)) is attached all round to the sclerotica where the latter joins the cornea. The *annulus albidus,* long conjectured, on physiological grounds, to be muscular, has of late years been proved to be so by microscopical observation. The fibres are of the unstriped kind, and are disposed in orbicular and radiating fasciculi. The ciliary nerves, on their way to the iris, pass through and supply the muscular substance of the annulus albidus.

Interposed between the outer surface of the choroid and the inner surface of the sclerotica, is a fine cellular tissue interspersed with irregularly shaped pigment cells. This is the structure known by the name of *lamina fusca* or *arachnoidea oculi* (5.).

II. PARTS SUBSIDIARY TO THE PERFECTION OF THE EYE AS AN OPTICAL INSTRUMENT.

Iris.

So far as regards position, the iris (12.) may be said to bear a relation to the choroid, somewhat similar to that which the cornea bears to the sclerotica. It is a disk, or circular membrane, perforated by an aperture, called the *pupil* (13.), continuous by its circumference with the choroid through the medium of the ciliary body and annulus albidus. The iris is extended in a plane behind the cornea, dividing the aqueous cavity into two unequally-sized compartments, called the chambers of the aqueous humour (30. 31.). The pupil, through which these compartments communicate, is situated, not exactly in the centre of the iris, but a little towards the nasal and upper side; its boundary, which is free in the aqueous humour, is called the *pupillary edge* of the iris. The anterior surface of the membrane presents a radiating streaked appearance, produced by whitish tendinous-like fibres. At the distance of about $\frac{1}{30}$th of an inch from the pupillary margin, these fibres run into irregular knots all round, whence, collected into larger bundles, they radiate towards the circumference. The portion of iris between the circumference and the corona of knots just mentioned, is named the *outer* or *larger ring;* and that between the corona of knots and the pupillary margin, the *inner* or *smaller ring.*

The colour of the iris, which is different in different persons, depends, partly on pigment cells which, like an epithelium, are dispersed on its anterior surface, and partly on the presence of pigment deposits in its substance, the tint being deepened by the uvea or dark pigment behind. On the removal of the uvea, the posterior surface of the iris is seen to be marked with ridges, converging from the connexion of the iris with the ciliary body, towards the pupil.

In its structure, the iris comprises unstriped muscular fibres, nerves, and blood-vessels, with cellular tissue. The muscular fibres are disposed in two different directions; the one set situated in the larger ring, and disposed in a somewhat radiating direction; the other situated in the smaller ring, and disposed circularly round the pupil. It is by the action of these antagonistic sets of muscular fibres that the well known variation in the size of the pupil is produced; the radiating fibres, by their contraction, dilating the pupil; the circular fibres, by theirs, contracting it. The state of relaxation of the iris is that in which the pupil is neither much contracted nor much dilated; a medium state, in which the pupil always is some time after death, and to which, in consequence of an elasticity which the tissue of the iris at the same time possesses, it has a constant tendency to return after the dilating or contracting force has ceased to act.

The iris, like the choroid, is rich in blood-vessels. Its arteries are the *long posterior ciliaries*, branches from the *short posterior ciliaries* ramifying in the ciliary processes, and branches from the *anterior ciliaries.* These different vessels form a vascular anastomosis at the circumference of the iris, from which branches proceed towards its pupillary edge, near which they form another finer vascular network, whence capillary loops extend to the pupillary margin. The long posterior ciliaries perforate the sclerotica, a little further from the optic nerve than the short posterior ciliaries do; and proceed on the outer surface of the choroid towards the iris, one on the temporal, the other on the nasal side of the eye, in a line corresponding to the equator of the ball. Each of these arteries divides at some distance from the ciliary margin of the iris, about $\frac{1}{4}$th of an inch on the temporal side, less on the nasal side, at an acute angle, into two branches—an upper and a lower. The upper branches of the two arteries inosculate above, and the lower, below, in the substance of the annulus albidus, from whence their ramifications proceed to open into the first vascular circle above-mentioned. There are veins corresponding to the posterior ciliary arteries. The veins corresponding to the anterior ciliaries have a communication with the *sinus circularis iridis* (3.); a canal of a size to admit a hair, which is lodged in a groove on the inner surface of the sclerotica all round, where the latter joins the cornea and receives the insertion of the ciliary ligament.

The ciliary nerves, which arise in the orbit from the lenticular ganglion and nasal branch of the fifth, and, as above-mentioned, enter the eye through the sclerotica behind, to pass forward on the outer surface of the choroid and supply the muscular substance of the annulus albidus, at last reach the iris, where they are distributed to its muscular fibres.

Of the fibrils of the ciliary nerves, those which govern the circular muscle of the iris are originally derived from the third nerve; and those which govern the radiating muscle, from the spinal and sympathetic in the neck.

To return to the membrane of Descemet (6.): from the cornea it is continued, to a very limited extent, upon the inner surface of the sclerotica, at its juncture with the cornea, and thence upon the ciliary ligament, from which, becoming modified in texture, it is reflected on the anterior surface of the iris at its circumference.

Pigment membrane.

The inner surface of the choroid and ciliary body, and the posterior surface of the iris, are lined with the pigment membrane (14). Though called *black*, the colour in the human eye is *brown;* lighter in shade on the choroid, darker on the ciliary body and iris. If a shred of the pigment membrane from the choroid be examined under the microscope, it is seen to be composed of flat six-sided nucleated cells, about $\frac{1}{1000}$th of an inch in diameter, joined together at their edge, by intercellular substance, in a single layer, like mosaic work (*Fig. ii.*). The colouring matter consists of very minute granules which constitute the contents of the cells and are most accumulated at their circumference, leaving the clear nucleus distinctly seen in the centre. In

Fig. ii.

albinoes, the cells contain no coloured granules. Their nuclei then appear very prominently. In those animals in which there is, on the inner surface of the choroid, what is called the *tapetum lucidum*, the membrane, immediately over the most brilliant part, is also, as in albinoes, destitute of pigment granules.

The cells of the part of the pigment membrane lining the ciliary body are round and irregularly heaped together, so that the membrane here does not present the beautiful mosaic-work appearance which it does on the inner surface of the choroid.

The pigment on the posterior surface of the iris, called *uvea*, (a name applied, however, sometimes to the choroid, and frequently to the whole of the iris), is composed of incompletely formed cells, *i. e.* aggregations of pigment granules with nuclei in their centre, but destitute of cell-wall. The pigment granules, thus loosely deposited, are prevented from mingling with the aqueous humour by a very delicate membrane, called the *membrane of the posterior chamber of the aqueous humour*, with which the posterior surface of the uvea is invested (15.).

III. Specially Sensitive Parts.

Optic nerve.

The fibres (17) of the optic nerve visible to the naked eye, are fasciculi of microscopical primitive fibrils, enclosed in a neurilemma or cellular sheath, and the whole enveloped in a general neurilemma. The neurilemmata of the fibres cease as the nerve penetrates the sclerotica, whence arises the constriction of the nerve at that place, and the appearance commonly described under the name of *cribriform lamina* of the sclerotica. There, free from neurilemma, the optic nerve passes through a well defined opening in the choroid, to join the retina. About the third of an inch from the sclerotica, the optic nerve is perforated obliquely from below, by the central artery and vein of the retina (18.), which run in a canal in the axis of the nerve, to gain the interior of the eye.

Retina.

The *retina* (20.) is a transparent expansion of nervous substance, situated within the pigment membrane lining the choroid, continuous behind with the optic nerve, which, at the place of junction, forms a slight prominence (19.) called *papilla conica*, and terminating anteriorly at the *ora serrata*, or place of transition of the choroid into the ciliary body.

At the place corresponding to the antero-posterior axis of the eyeball, and $\frac{1}{5}$th of an inch on the temporal side of the entrance of the optic nerve, the retina presents a transparent point (21.), and is, for the extent of $\frac{1}{10}$th of an inch all round, of a yellow colour. These appearances, which are found only in the eye of man and the monkey tribe, were discovered, in 1791, by S. T. Soemmerring, who, supposing the transparent point to be actually a perforation of the retina, called it *foramen retinæ centrale*, and the yellow border, *limbus luteus foraminis centralis.* In this situation the retina is, on dissection, always found raised into a small fold, which extends from near the temporal side of the optic nerve, transversely outwards for about $\frac{1}{5}$th or $\frac{1}{6}$th of an inch. The blood-vessels of the retina, usually quite distinctly seen, are ramifications of the central artery and accompanying vein.

The retina is of very complex intimate structure. According to the latest researches, it comprises five different kinds of elements disposed in successive strata; *viz.*, proceeding from without inwards, 1. stratum bacillosum, 2. stratum granulosum, 3. stratum gangliosum, 4. stratum fibrillosum, and 5. stratum limitans.

The *stratum bacillosum* consists of columnar bodies, of a peculiarly clear substance, about $\frac{1}{1100}$th of an inch long and $\frac{1}{14000}$th of an inch thick, arranged side by side, and vertically to the surface of the retina; so that if a bit of the retina, together with the corresponding portion of the vitreous body, be carefully removed from the eye, disposed on a glass plate with the outer surface of the retina uppermost, and examined with the microscope, the outer and thicker ends of the columnar bodies are seen arranged like minute tessellated work. Interspersed through this tessellated-looking surface at intervals, the wider the further forward the part of the retina which is examined, we observe spots, as if two or three columns were wanting (*Fig. iii.*). These spots are owing to the presence of thicker but shorter columns, which, towards the subjacent stratum, are swollen out into fusiform or spigot-shaped bodies. From the inner ends of these fusiform dilatations of the thicker, as well as from the inner ends of the thinner columns, delicate filamentary prolongations are said to extend through the other strata of the retina towards its inner surface.

Fig. iii.

By the action of water the structure of the stratum bacillosum, both as a whole and in its component columns, is speedily and remarkably altered. The change of the stratum as a whole, consists in its detachment from the rest of the retina, and that in a continuous film, but of much greater superficial extent than the surface from which it has separated. In this state, it constitutes what was first observed and described by Dr. Jacob, and has since been usually demonstrated under the name of *membrana Jacobi.*

In regard to the change in its component parts we observe, that the columns readily become variously distorted, and at last acquire the form and appearance of very pale globules, held together by the same uniting medium as that by which the rods are in their natural state held together. It is to this change that the great increase of superficial extent is owing, which the stratum bacillosum, now altered into Jacob's membrane, presents.

Its natural condition above described, was first discovered by Dr. Hannover of Copenhagen. The prolongations of its component columns, through the subjacent strata, towards the inner surface of the retina, were subsequently pointed out by Dr. H. Müller, and confirmed by Dr. Kölliker, in the human eye.

To the stratum bacillosum succeeds a layer of nuclear-like bodies, *stratum granulosum*, connected with the inward prolongations of the columnar bodies. The bodies of which this layer consists, measure from $\frac{1}{3000}$th to $\frac{1}{4000}$th of an inch in diameter.

After this comes a layer of ganglionic corpuscles, with filamentary processes (*stratum gangliosum*). Then we have the layer composed of the primitive fibrils of the optic nerve (*stratum fibrillosum*). These fibrils, which are very delicate, spread out in a radiating direction from the entrance of the optic nerve. The fibrils are at first collected in fasciculi, which by frequent interchange of fibres form plexuses with much-elongated meshes. In proceeding forward, the meshes gradually become wider, and the fibres more dispersed. The mode of termination of the fibrils has not been with certainty determined.

Lastly, a homogeneous membrane forms the inner superficial boundary of the retina (*membrana limitans*).

In regard to the disposition of the above elements of the retina at the central point and limbus luteus:—At the central point the stratum granulosum is absent. In the situation of the yellow spot the smaller columnar bodies are wanting, the larger spigot-like bodies alone form this part of the stratum bacillosum. Here, also, the optic fibrils are few, and form no continuous layer between the ganglionic stratum and membrana limitans.

The capillary network of the retina, is seated partly in the fibrillous stratum, but chiefly in the ganglionic. The branches of the central artery and vein of the retina, proceeding to and from the capillary network, are seated under the membrana limitans.

IV. Dioptric Parts, Refractive Media, or Lenses.

Vitreous Body.

The vitreous body (22.) is a transparent gelatiniform mass, situated immediately within the retina, and filling the middle and back part of the interior of the eyeball. It presents a concavity in front, called *fossa hyaloidea*, into which the crystalline body is received. The vitreous body consists of a very delicate and transparent enclosing membrane, called the *hyaloid* (23.); numerous processes of which are considered to extend into the interior, like the sectors of an orange according to Dr. Hannover, enclosing spaces in which a watery fluid, called the *vitreous humour*, is contained. This fluid slowly drains away when the vitreous body is punctured, and is found, under the microscope, to contain a few colourless cells. In old age the membraneous septa tend to disappear, so that, in operations for the extraction of cataract for example, a more or less considerable quantity of vitreous humour is apt to be suddenly evacuated.

Crystalline Body, comprising the Lens and its Capsule.

The crystalline body (27. 28. 29.), as above said, lies in the hyaloid fossa of the vitreous body. It is a double convex lens about $\frac{7}{20}$ths of an inch in diameter, and half as much in thickness at its axis. Its anterior surface is less convex than its posterior, the radius of the convexity of the former (*a*, *Fig. iv.*), being much the same as that of the cornea, *i. e.* $\frac{13}{40}$ths of an inch; the radius of the convexity of the latter (*b*, *Fig. iv.*), $\frac{9}{40}$ths of an inch. At its circumference it is thick and rounded, as is represented in the section.

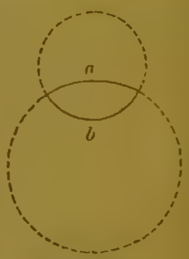


Fig. iv.

The axis of the crystalline body does not lie exactly in that of the eyeball, but a little to the nasal side, corresponding to the middle of the pupil.

The crystalline body comprehends the lens (27.) and capsule (28. 29.).

The *capsule* of the lens is a transparent, elastic, but easily lacerable, homogeneous membrane, somewhat resembling the membrane of Descemet. Its anterior wall (28.) is thicker than its posterior (29.). The posterior wall lies close upon the vitreous mass, and the union between them is intimate, though capable of being dissolved by maceration. On the inner surface of the anterior wall there is a layer of tessellated epithelium, first demonstrated by Dr. Werneck of Salzburg.

The lens, which increases in consistence from without inwards, is composed of tubular fibres, filled with a clear viscid substance. They are flat, being about $\frac{1}{3000}$th of an inch broad and $\frac{1}{19000}$ of an inch thick, and their transverse section is hexagonal. This is just such a form as tubular fibres, closely aggregated together and stratified, necessarily assume. The fibres, thus aggregated together, are so arranged and disposed that they extend, say from about the middle of the anterior surface, turning round the circumferential edge, towards the middle of the posterior surface; in fact, something like the lines of longitude in the maps of the world. It is to be remarked, that the fibres do not converge to points on the anterior and posterior surfaces, but to radiating clefts, filled with a transparent homogeneous-like substance. Though there are no actually distinct layers, the fibrous structure is separable by dissection in concentric strata, which are denser the nearer they are to the centre of the lens.

Betwixt the lens and capsule, a fluid called *liquor Morgagni*, has been said to exist; and indeed, if the capsule of the lens of a sheep's eye, a day or two after death, be punctured, a liquid escapes; but this is a *post mortem* accumulation, arising from the aqueous humour having passed through the capsule by endosmosis, and mixed with the detached inner epithelium of the capsule and soft outermost part of the lens.

Ciliary Zone and Canal of Petit.

Around the circumference of the crystalline, as it lies embedded in the vitreous body, the hyaloid membrane is, for the breadth of $\frac{1}{5}$th of an inch, raised up into radiating folds. This is what is called the *zonula ciliaris* or *zonula Zinnii* (25.). It is the counterpart of the ciliary body of the choroid, with which it is dovetailed, the folds and intervening depressions of the two structures being received into each other. At the place where the ciliary body of the choroid and ciliary zone of the hyaloid begin posteriorly to be thus dovetailed with each other, the retina terminates in a serrated edge; but branches of the retinal blood-vessels extend forward. In separating the ciliary body from the ciliary zone, some fragments of the pigment membrane of the former generally remain adherent to the latter, and hence the ciliary zone has been considered merely as an impression of the ciliary body, and called *halo signatus.* Besides the folds of the hyaloid, the ciliary zone comprises in its structure peculiar fibres, something like those of elastic tissue, which extend from its posterior margin to the capsule of the lens. To the corona formed by the aggregate of these fibres, the name *orbiculus capsulo-ciliaris* has been given.

The united folds of the ciliary zone and ciliary processes, overlap the circumference of the lens in front, but do not adhere to it, there being betwixt them a ring of transparent hyaloid, called *zonula lucida*, broader on the temporal than on the nasal side.

Around the circumference of the crystalline body there is a space which may be inflated into the form of a beaded ring, by blowing through a puncture in the zonula. This is the *canal of Petit* (26.), which is usually considered as being formed by a separation of the hyaloid into two layers, one passing behind the capsule of the lens, adhering to it and lining the hyaloid fossa; the other, that which forms the ciliary zone, being inserted into the circumferential part of the capsule of the lens.

Aqueous Humour.

This watery fluid, examined under the microscope, is found to contain in suspension, a few colourless cells. The form of the aqueous humour is determined by that of the compartment in which it is contained (30. 31.). This compartment is bounded in front by the cornea, behind by the crystalline body, and at its circumference by the ciliary processes and ligament; and is subdivided by the iris into the anterior (31.) and posterior (30.) chambers of the aqueous humour, communicating with each other through the pupil (13.). The depth of the whole aqueous humour, from the posterior surface of the cornea, through the pupil, to the anterior surface of the crystalline, is rather more than $\frac{1}{10}$th of an inch.

From the membrane above referred to, as investing the uvea or the posterior surface of the iris, a continuous surface may be traced over the free extremities of the ciliary processes, and from them to the circumference of the capsule (15.).

In the preceding sketch, the curvatures of the refractive media have been spoken of as if spherical, but they are in reality not so. The curvature of the cornea appears to be ellipsoidal, with the long axis not exactly in the direction of the incident rays, but slightly inclined from before backwards and to the temporal side. The curvatures of the aqueous humour which, as a whole, has something of the form of a meniscus, depend on those of the posterior surface of the cornea and anterior surface of the lens. As to the curvatures of the lens, that of its anterior surface is ellipsoidal, with the lesser axis in the direction of the incident rays, while that of its posterior surface appears to be hyperbolical. The curvature of the hyaloid fossa of the vitreous body corresponds with that of the posterior surface of the crystalline, while the posterior curvature of the vitreous body corresponds with the concavity of the retina, which is probably ellipsoidal.

POSTSCRIPT.

General Plan of Distribution of the Blood-vessels of the Eyeball.

To give a correct idea of the distribution of the blood-vessels of the eyeball, it will be necessary to make a few preliminary observations on its development.

Of the different constituents of the eyeball, the retina, which, along with the vitreous body, is the fundamental part of the posterior segment, is originally a diverticulum from the brain. These parts receive their supply of blood from the central vessels of the retina.

The central artery of the retina, as already said, enters the eyeball through the substance of the optic nerve, and divides into two sets of branches; one set, which is a persistent one, to the retina, as already explained; another set, to the vitreous body, as well as to a structure which exists in front of the vitreous body, in the early stage of formation; namely, the vascular capsule of the lens presently to be described.

The latter set of branches has merely a temporary existence. Their trunk, which is the third branch of the central artery of the retina, and called the central artery of the vitreous body, divides, on entering the hyaloid canal (24.) of that body, into the central artery, properly so called, and circumferential branches.

The ramifications of these vessels are dispersed throughout the vitreous body, anastomosing with each other.

The central artery having given off its ramifications, passes out from the vitreous body, at the middle part of the hyaloid fossa, in which the crystalline body is seated. There the artery enters and ramifies in a capsule enclosing the crystalline body, not the capsule of the lens, formerly described as structureless, transparent, and non-vascular, but the vascular capsule just now referred to as having a temporary existence only.

This vascular capsule appears to be originally an involution of the skin.

From the point where the artery enters the middle of this capsule, it radiates towards its circumference and from thence turns round to its anterior wall. At the circumference corresponding to the zonula ciliaris, these vessels anastomose with the vessels of the zonula; these again, being in connexion with, or derived from the retinal vessels and the circumferential branches of the vitreous body, perhaps also in connexion with the vessels of the ciliary body.

With the development of the eye, the vascular capsule of the crystalline body grows in a greater ratio than does the crystalline body itself; its anterior part coming to line, though not adhering to the walls of the aqueous chamber. The iris not having yet been developed, the aqueous chamber is not hitherto divided into anterior and posterior chambers.

When, however, the iris does sprout out, it soon comes into contact with, and adheres to this vascular capsule of the crystalline, in such a way that the anterior wall of the capsule closes in the pupil, constituting what is known by the name of the *pupillary membrane;* the rest of the capsule, constituting what is called the *capsulo-pupillary membrane*, extending backwards from the pupil through the posterior chamber, to be continued into the posterior wall, which still lies between the hyaloid fossa and the crystalline body. The iris having joined the vascular capsule of the crystalline in the manner now explained, its vessels shoot into that membrane, and anastomose with its original vessels.

The iris continuing to grow, its pupillary or small ring shoots forth beyond the point where the first-formed part of the iris, or the ciliary ring, joined the vascular capsule of the crystalline; and this in such a way that the point of the junction in question comes to be on the anterior surface of the iris where the ciliary joins the pupillary ring; the edge of the pupil thus exists quite free. Such is the vascular distribution of the retina and humours, in the early stage of the formation of the eye. The vascular distribution in the choroid is the same as we have already described it to be in the fully formed condition.

In regard to the cornea, it owes its vascularity to ramifications from the anterior ciliary and conjunctival vessels.

It is thus perceived that the parts of the eyeball, through which, when the organ is fully formed and called into use, the rays of light have to pass on their way to the retina, are in the early stage of formation interwoven with blood-vessels. These blood-vessels are necessary for the full develop- of the organ; but this having been accomplished, a smaller number of vessels is sufficient to minister to its nutrition, and these are dispersed in parts of it through which the rays of light are not required to pass.

Vessels which are distributed in parts through which the rays of light are required to pass on their way to the retina, become obliterated; the cornea thus ceases to be vascular; the pupillary membrane, contingently with the obliteration of its vessels, disappears. This disappearance usually occurs before birth, or about the eighth month. Coincident with this, the pupillary ring of the iris, which was before small, acquires its full development. The capsulo-pupillary membrane, the other part of the vascular capsule of the crystalline body, has in like manner disappeared; this disappearance having occurred before that of the pupillary membrane, no traces of it remaining.

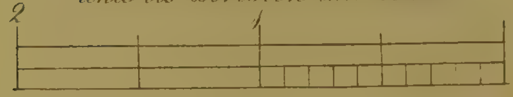
As is the case with regard to the cornea, the blood-vessels of the vitreous body become obliterated, the body itself remaining and drawing the materials for its nutrition from the blood-vessels of the neighbouring parts.

Thus the cornea, in its fully formed state, is nourished from the vessels of the neighbouring parts of the conjunctiva and sclerotica.

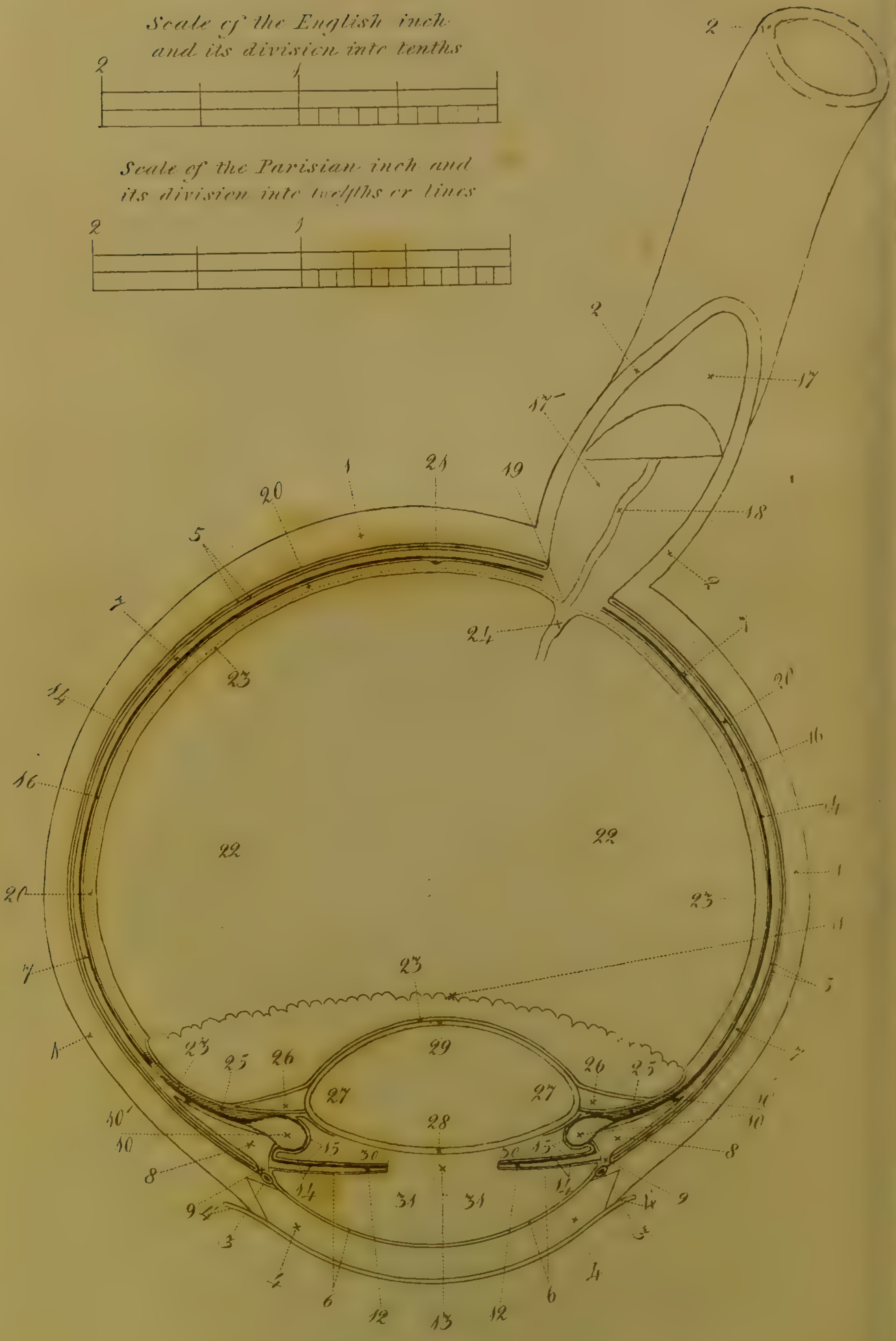
The aqueous humour appears to be supplied by transudation from the vessels of the ciliary processes. The lens never was vascular, but at first surrounded by a vascular membrane, and it continues to receive nourishment from the vascular network of the zonula Zinnii.

The whole posterior surface of the vitreous body being in contact with the vascular layer of the retina, the vessels of which are persistent, is from it supplied with nourishment, as also from the ciliary zone on its lateral part, anteriorly.

Scale of the English inch and its division into tenths



Scale of the Parisian inch and its division into twelfths or lines



The non-vascular layers of the retina are nourished from the vascular layer. The non-vascular membrane of the pigment has its supply from the capillary network on the inner surface of the choroid.

REFERENCES TO THE HORIZONTAL SECTION, PLATE I.

1. Sclerotica.

2. Sheath of the optic nerve, a continuation of the dura mater.

3. Circular venous sinus of the iris.

4. Proper substance of the cornea.

4′. Conjunctiva extending over the cornea.

5. Membrana fusca or arachnoidea oculi.

6. Membrane of the anterior chamber of the aqueous humour. Of the two dotted lines, the short one points to the membrane of Descemet, the long to the supposed continuation of that membrane over the anterior surface of the iris.

7. Choroid.

8. Annulus albidus, or ciliary muscle.

9. Ciliary ligament.

10. 10′. Ciliary body, consisting of (10′.) a pars non-plicata, and (10.) a pars plicata formed by the ciliary processes.

11. Ora serrata of the ciliary body, and anterior limit of retina.

12. Iris.

13. Pupil.

14. Membrane of the pigment.

15. Delicate membrane lining the posterior chamber of the aqueous humour.

16. Stratum bacillosum of retina, or membrane of Jacob.

17. The optic nerve surrounded by its general neurilemma.

17′. The fibres of the optic nerve, consisting of fasciculi of primitive tubules.

18. Central artery of the retina.

19. Papilla conica of the optic nerve.

20. Retina. The situation of its membrana limitans is indicated by a dotted line.

21. Central transparent point of the retina, or foramen centrale of Soemmerring.

22. Vitreous body.

23. Hyaloid membrane.

24. Canalis hyaloideus.

25. Zonula ciliaris.
26. Canal of Petit.
27. Crystalline lens.
28. Anterior wall of the capsule of the lens.
29. Posterior wall of the capsule of the lens.
30. Posterior chamber of the aqueous humour.
31. Anterior chamber of the aqueous humour.

EXPLANATION OF PLATE II.

Fig. 1. Crystalline capsule, extracted entire. See p. 839.

2. Glaucomatous lens, as seen by transmitted light. See p. 896.

3. Four varieties of entohyaloid spectra; *a.* pearly spectra; *b.* watery spectra; *c.* obscurely defined insulo-globular spectra; *d.* sharply defined insulo-globular spectra. See p. 951.

4. Cysticercus cellulosæ in anterior chamber. See Case 943, p. 1091.

5. Cysticercus cellulosæ in anterior chamber. See Case 944 p. 1092.

6. Cysticercus cellulosæ, removed from eye in Case 943, magnifie about six diameters.

7. Neck and head of cysticercus cellulosæ, removed from eye i Case 944, magnified about twelve diameters.

PLATE

Fig. 4

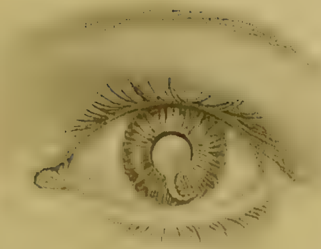


Fig. 5

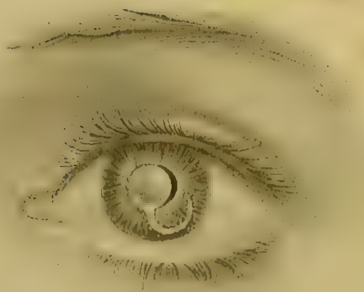


Fig. 1

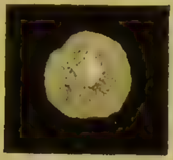


Fig. 3

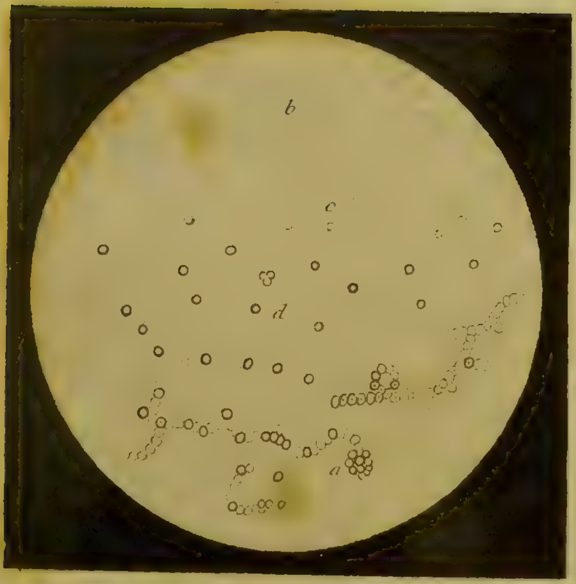


Fig. 6

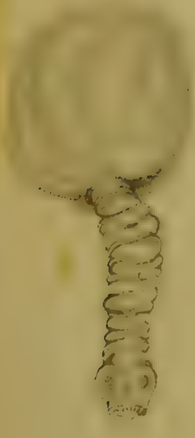


Fig. 2

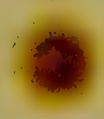
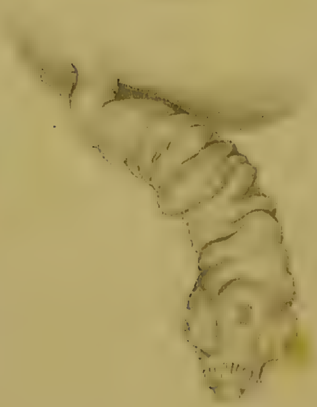


Fig. 7



A

PRACTICAL TREATISE

ON THE

DISEASES OF THE EYE.

CHAPTER I.

DISEASES OF THE ORBIT.

SECTION I. — INJURIES OF THE ORBIT.

In considering injuries of the orbit, it is impossible to avoid noticing the effects produced on the investments and contents of this cavity; or, in treating of wounds penetrating the walls of the orbit, to pass over in silence the injuries which, in this way, the brain and other surrounding organs may sustain. Cases occur, indeed, in which it is doubtful, to the injury of what particular part, without, within, or beyond the orbit, the effects which arise ought to be attributed. Amaurosis, for example, one of the chief consequences to be apprehended from wounds of the orbit, appears sometimes to be owing to injury of the branches of the fifth nerve exterior to that cavity; in other cases, to injury of the optic or other nerves within the orbit, or of the eye itself; and, in other cases, to injury of the brain.

§ 1. *Contusions on the Edge of the Orbit.*

Blows, falls, and similar accidents are apt, especially in scrofulous children, as I shall explain more fully in the next section, to excite inflammation, running into suppuration, and affecting the periosteum, and even the substance of the bones forming the edge of the orbit.

From blows on the edge of the orbit, particularly its upper edge, we must be prepared, however, to meet occasionally with still more serious consequences than an affection of the bone or its periosteum. Effusion of blood within the cranium, concussion of the brain, or inflammation of its substance, or of its membranes, may be excited by such an injury; and while we are perhaps confining our fears to the state of the bone, or of the soft parts which cover it, changes may be going on within, which shall suddenly prove fatal.

Case 1.—Henry II., king of France, was struck, in a tilting-match, above the right eyebrow. The skin was torn across the forehead to the external angle of the left eye, in the substance of which there stuck several small bits of the shivered lance. There was no fracture. The injury proved mortal on the 11th day. On opening the head, Paré found a quantity of blood effused between the dura and the pia mater, under the middle of the occipital bone; and the substance of the brain at that place changed in colour and consistence.[1]

Case 2.—Mr. Dease[2] was called to a woman who had been struck with a pewter quart over the left eye, and had thus received a wound about an inch and a half long, laying bare the bone. She died on the 26th day from the receipt of the injury. On dissection, the dura mater under the wound was found detached, and slightly spotted with matter, the anterior part of the left hemisphere of the brain in a state of suppuration, and some fluid matter lying on the anterior and left fossa cerebri.

Case 3.—A man received a wound 18 lines long, above the right eyebrow. On the third or fourth day, fever and sleeplessness came on; the edges of the wound became tender and swollen; the patient vomited bile; he fell into a state of delirium; his abdomen was painful, especially the right hypochondrium. The symptoms grew speedily worse, locked-jaw supervened, and the man died on the 7th day. A large quantity of pus was found beneath the pericranium, in contact with the falx, and on the tentorium; the surface of the brain was highly injected, and of a darker colour than natural; the liver large, and its peritoneal covering thickened; the intestines contracted, and presenting here and there spots of purulent exudation.[3]

Consequences not less serious have been known to result from injuries of a similar sort, received at the lower edge of the orbit. Thus Petit relates a case of palsy of the left side, and death, from suppuration in the right hemisphere of the brain, consequent to a wound at the lower edge of the right orbit, close to the exit of the infra-orbitary nerve, which, however, did not appear to have been injured.[4]

Contusion of its temporal edge has been sometimes followed by the growth of encysted and other tumours within the orbit. These effects, however, as well as inflammation of the various parts contained within that cavity, and the formation of exostoses, excited by the same cause, will require separate consideration hereafter.

§ 2. *Fractures of the Edge of the Orbit.*

The only recent instance of this injury I recollect to have seen, was from a blow with the end of a long piece of wood, which struck the lower edge of the orbit, and separated a fragment, which I concluded to be the anterior angle of the malar bone. The fractured piece moved at first easily under the finger, in different directions, but became united in the course of a few weeks. No bandage was applied; but cases may occur in which, the eyelids being previously closed, compresses might be judiciously employed, with a roller round the head, to keep the fractured portion of the edge of the orbit in contact with the bone from which it had been separated, till the process of reunion should be completed.

Case 4.—A butcher was leaping from a barrel to the ground, and not observing a flesh-hook which hung close by him, it caught him by the middle of the left orbitary arch, and fairly took the piece of bone with it, tearing of course the integuments and the eyebrow. The wound healed in such a way as to leave the lid peaked up in the middle, so that the patient could not completely close the eye, which consequently was exposed to frequent attacks of inflammation. During one of these he consulted me, several years after the accident. The deficiency of the bone was very perceptible, and added to the deformity produced by the lagophthalmos. The ophthalmia was puro-mucous, and soon subsided under the use of a solution of nitrate of silver.

Case 5. — Dr. Scott relates[5] that a soldier, riding into the town of Douglas, Isle of Man, in a December night, was caught by the hook of an iron lamp-supporter, which, fixing beneath the superciliary ridge of the right orbit, tore away that part of the bone, and wounded the brain. He recovered perfectly in about four weeks.

Case 6. — Biermayer[6] records the case of a boy who, being struck with a stone at the inner angle of the eye, was, on the 5th day after the injury, seized with tetanus, and died in a few hours. On dissection, a small portion of the nasal process of the superior maxillary bone was found lying loose in the abscess at the seat of the injury, and in contact with one of the branches of the infra-orbitary nerve.

Of fractures of the edge of the orbit extending into the frontal or maxillary sinus, or into the ethmoid cells, the consequence sometimes is, that on blowing the nose, air, passing through the fracture, is introduced into the cellular membrane of the eyelids, which suddenly become swollen, and crepitate under pressure. In such cases, of which I shall have occasion again to speak under the head of *Emphysema of the Eyelids*, it is scarcely necessary to open the integuments with the lancet, to let the air escape. Its presence is of no moment; but the patient should avoid blowing his nose, till the fracture is consolidated.

§ 3. *Fractures of the Walls of the Orbit, attending Fractured Skull.*

Fractures of the skull not unfrequently penetrate into one or both of the orbits; and it is worthy of observation that, if the roof of the orbit be broken in this way, it is apt to be attended by laceration of the dura mater, and injury of the anterior lobes of the cerebrum, which rest upon the orbits. Suppose that this is the case, while at the same time a fracture with depression is present, we shall say on the temple, and that this fractured piece of the skull is raised into its place by the operation of trepan, the patient will, in all probability, not be relieved; the symptoms of pressure on the brain, or of inflammation within the head, will most likely remain as before, and death follow, contrary, perhaps, to what might have been expected, if the fractured temple had been the sole injury. It will probably be only on dissection that, in such a case, the cause of death will be discovered.

Case 7. — Sir George Ballingall[7] has recorded a case of compound fracture of the os frontis, in which, after the depressed pieces of bone were removed, the patient instantly recovered his senses, and answered questions rationally. He soon lapsed, however, into a comatose state, and died within 48 hours of the receipt of the injury. On dissection, the fracture was found to extend backwards, through both orbitary plates of the frontal bone, and to pass across the ethmoid behind the crista galli. Opposite to the fissures in the roof of each orbit, the dura mater was found lacerated to a considerable extent, and portions of brain protruding. The anterior lobes of the brain were disorganized and broken down; and there was a distinct appearance of purulent matter upon the tunica arachnoidea covering each hemisphere of the brain, although the patient had survived the accident for so short a time, lost a considerable quantity of blood from the wound, and manifested no inflammatory symptoms.

In cases of fractured skull extending to the orbit, it sometimes happens, that portions of the walls of this cavity are so completely separated, that they easily come away, either in dressing the wound, or in raising the depressed pieces of the skull. The mere circumstance of a portion of bone being loose, is not sufficient ground for removing it; for if its surfaces are still attached to the membranes with which they are naturally in connection, it may be susceptible of reunion; but if the bone be extremely shattered, and pressed partly through the dura mater, we are warranted in extracting the loose pieces.

Case 8. — Cheselden[8] communicates a case of this kind, which occurred in the practice of Mr. Cagua, in which five splinters of the cranium, depressed into the substance of the brain, were extracted, the largest piece comprehending part of the orbitary plate of the frontal, of the great wing of the sphenoid, and of the suture which connects the external angular process of the frontal to the superior angle of the malar bone. Pieces of the substance of the brain followed the removal of this splinter; yet the patient, a boy of ten years of age, perfectly recovered.

Case 9. — A similar case, also terminating favourably, is recorded[9] by Dr. Klein, in which several large portions of the frontal bone were removed; the roof of one of the orbits was completely loose; a wide hiatus, separating the ethmoid from the neighbouring bones, ran down towards the basis of the skull; and considerable portions of brain were discharged.

Case 10. — I was consulted, in October 1842, by a man whose right eye was totally amaurotic, and lay depressed and everted in its orbit. On passing the hand over the forehead, the right portion of the frontal bone presented a triangular elevation, showing the seat of a former fracture. Six months before, he had received a severe blow on the right temple, but no fracture was then detected. He lay insensible for 14 days after the accident. The bone was exposed to the extent of an inch. All the symptoms of concussion of the brain followed. The right eye projected considerably, as if from the pressure of effused blood within the orbit. Now it had retreated. I considered it likely that there had been fracture of the orbit.

§ 4. *Fractures of the Walls of the Orbit, attending Fractured Bones of the Face.*

Of this sort of accident it may be sufficient to give the following illustration: —

Case 11.—John Lewis, aged 11, had his face crushed by the wheel of a carriage, and the bones of the nose and cheek fractured. He lay with little appearance of sensibility, but understood and replied to questions when roused. He had no paralysis; but it was thought that some convulsive twitches occasionally took place on the left side. There was ecchymosis about both eyes, and some laceration under the left, and about the nose. He died on the 6th day after the injury.

On removing the scalp, several patches of ecchymosis were seen between it and the calvaria; the largest of these was situated at the posterior part of the head. At these spots, the scalp scarcely adhered to the calvaria, but elsewhere it did so with considerable firmness. The internal surface of the dura mater was of a light red; between it and the arachnoid, on the left side, there was a pretty generally diffused layer of puriform lymph of a light yellow colour with a tinge of green, which adhered partly to the dura mater, and partly to the arachnoid. It dipped down between the hemispheres, but was wholly confined to the left side of the falx. At the under part of the left anterior lobe, a portion of brain of about the size of a shilling was softened to the depth of about half an inch; and a few minute ecchymosed spots, such as are usually met with in lacerated brain, were visible at this part. There was very little laceration of the dura mater, but a portion of the left orbitary plate of the os frontis appeared to have been pushed inwards, so as to bruise the brain at the part above-mentioned. The fracture was continued through the sphenoid bone by the side of the left cavernous sinus, and at this part there was a considerable quantity of extravasated and coagulated blood beneath the dura mater.[10]

§ 5. *Orbit Fractured by a Blow on the Eye.*

The following case related[11] by Duverney has sometimes been referred to, as an example of this sort of injury; but it may fairly be doubted if, in this instance, the fracture of the orbit was actually produced through the medium of the eyeball.

Case 12.—A gentleman had his left eye crushed to pieces by a blow from a stone, and the orbit beaten in upon the brain. After the first shock till his death, which happened on the 7th day, his faculties remained entirely unimpaired, insomuch that some of his medical attendants pronounced it impossible the brain should be injured. On dissection, the cranium was found filled with brain in a softened state, mixed with fragments of bone. The whole substance of the brain, even to the cerebellum, was changed by disease. The anterior part of the sella Turcica was found broken.

§ 6. *Counter-Fractures of the Orbit.*

Fractures of the orbit sometimes take place, by what the French call *contre-coup*[12], in consequence of blows or falls on the forehead, or even on the occiput.

Case 13.—Bohnius[13] opened the body of a man who died in consequence of a blow with a stick, close to the right eyebrow. At the part struck there was an ecchymosis, but no wound; beneath the ecchymosis, the bone was sound and entire; but in the roof of the orbit, there was a fissure, an inch and a half long, running towards the sella Turcica, and the corresponding portion of the dura mater was ruptured.

After a fall or blow on the head, should an extravasation of blood appear in the upper eyelid, without its having received any contusion, it may be suspected that a counter-fracture of the upper wall of the orbit has taken place; if in the lower eyelid, that the floor of the orbit is broken.[14] It can be but seldom, if ever, that such fractures can be positively pronounced to exist, till after death. Indeed, it is of comparatively little importance to know of their existence during life, as they do not admit of any particular treatment, and as our attention will be directed chiefly to the concussion, and consequent inflammation of the brain, by which counter-fractures are attended.

§ 7. *Penetrating Wounds of the Walls of the Orbit.*

The smoothness and mobility of the eyeball, together with its smallness, compared with the size of the cavity in which it is placed, and its firm resistance, compared with the looseness of the parts interposed between it and the orbit, serve to explain how pointed bodies, thrust against this organ, are very apt to leave the eyeball uninjured, and to penetrate deep into the orbit, or even passing through its walls, to enter one or other of the neighbouring cavities. The nasal and cranial sides of the orbit, from their situation and extreme thinness, are especially liable to be thus injured. Perforation of the orbitary plate of the frontal bone in particular, is an accident to which the attention of the surgical student is early and forcibly drawn. The thinness and fragility of that plate, the readiness with which the brain may be reached through it, and the instantaneousness with which death has been known to follow, are among the earliest points impressed on the mind of the young anatomist. Thus Mr. John Bell, after attributing the thinness of the orbitary plate to "the continual rolling of the eye," with which that plate never comes into contract, and by which, therefore, it cannot be thinned, tells us, that "it is the aim of the fencer; and we have known in this country," adds he, "a young man killed by the push of a foil, which had lost its guard."[15]

Various effects may follow a penetrating wound of the orbit, and we may find the patient in one or other of very different states. The weapon may have been immediately withdrawn after the injury was inflicted; or the foreign body may still be fixed in the wound, and is to be extracted; or it may have sunk so deep, that it cannot be laid hold of. As for the effects of the injury, they may be slight and transient, or violent and immediately dangerous, or prolonged for a length of time. It is evident, that a dagger, or other weapon, directed outwards, so as to break though the suture between the malar and sphenoid bones into the temporal fossa, or directed downwards, so as to shatter the floor of the orbit, and enter the maxillary sinus, will not be productive of the same amount of dangerous consequences, as when the instrument of injury traverses the os planum of the ethmoid, or the orbitary plate of the frontal, or fractures the sphenoid where it gives passage to the optic nerve. I shall treat of gunshot wounds of the orbit separately; but I may here remark, that their effects correspond so far at least with those of common penetrating wounds, that from both we may occasionally expect hæmorrhage, extravasation of blood, blindness, strabismus, syncope, vomiting, coma, convulsions, palsy, and even death, as immediate effects; and as remote effects, fever, delirium, suppuration, caries, exfoliation of bone, and the like. In all such injuries, paralytic symptoms are most likely to arise from hæmorrhage into the cavity of the cranium; fever and delirium indicate inflammation of the membranes; rigors, suppuration; coma, convulsions, and dilated pupils, abscess of the brain.

1. *Trifling appearance of external wound.* A weapon, penetrating through the orbit, may strike deep into the brain, and yet so small an external wound be present as shall be apt to excite little or no suspicion of danger.

Case 14. — Ruysch relates the case of a man who was wounded in the left orbit, with the end of a stick, not particularly sharp. The injury appeared of little importance; yet the patient died soon after receiving the wound. The magistrates appointed Ruysch to examine the body, in order to discover the cause of the sudden death. Externally, he observed a slight degree of ecchymosis at the upper part of the eye; but on removing the calvaria, he found that the wound had penetrated to a considerable depth into the brain.[16]

Case 15. — Peter Borel mentions a still more remarkable case, of a man who was wounded with a sword in the left orbit. Thinking that the wound had not penetrated deep, he merely covered it with a plaister; after which he walked two leagues, and ate and drank heartily with his companions, exactly as if he had been well, being affected with no pain. Next morning he was found dead. The skull was opened, when the wound was found to have penetrated to the cerebellum.[17]

Such cases[18] sufficiently show how carefully our examination ought to be conducted, and how cautiously our prognosis delivered, when a wound appears to have penetrated towards the roof of the orbit.

In the following case symptoms of danger supervened early, and were treated with the appropriate remedies, although unfortunately without success: —

Case 16. — A man was brought into the London Hospital, 12th April, 1832, with a lacerated wound of the right upper eyelid. He stated that, while working on board a ship discharging coals, a hook used for raising the coals caught him by the eye, so that he was elevated to the height of several feet. His companions observing what had happened, suddenly let go the rope, so that the poor fellow fell heavily on the deck. He immediately withdrew the hook himself. On his admission to the hospital, he did not appear to be suffering from any serious injury. The eyeball was uninjured, and no fracture could be detected. His respiration was natural; his pulse 76, full, but not more than might have been expected in a robust man; pupils obedient to the light; no pain in the head.

He was bled to the extent of twenty ounces; a cold lotion was applied to the forehead; and two grains of calomel were ordered to be given every second hour. He passed a quiet night. Next morning, his pulse was 74, full, but free from hardness. He had very little pain in the head. His bowels had been opened three times. Twelve leeches were applied to the forehead, and the calomel continued. Symptoms of compression of the brain came on very suddenly at six in the evening. His breathing became stertorous; pupils contracted, and insensible to the stimulus of light; pulse 52, and labouring; he could not be roused by any noise. At this time, a quantity of blood, mixed apparently with cerebral substance, to the amount of about two ounces, escaped from the wound. He was again bled to the extent of twenty ounces; the blood cupped and buffy. Twelve leeches were applied to the temple. He lingered in this state till two o'clock next morning, when he died.

The orbitary plate of the frontal bone was found to be completely smashed, and a considerable portion of the anterior lobe of the right hemisphere of the brain wanting, it having escaped through the wound.[19]

2. *Differences in situation and extent of fractured orbit.* It is worthy of remark, that it is not the orbitary plate of the frontal bone alone which is apt to be fractured, when the weapon is directed towards the roof of the orbit; and that we are in some degree enabled to judge of the violence employed by the hand which held the weapon, even by the mere situation of the fracture, which in fatal cases is detected on dissection.

The following case of fatal wound of the brain through the orbit and ethmoid bone, is quoted by Bonetus:—

Case 17.—A countryman, about 55 years of age, was asked by one who met him to step out of the way; but as he was carrying a heavy burden at the time, he could not do so, and therefore refused. The other, provoked at this, struck the countryman violently over the shoulders with a whip; and when the whip broke, thrust the sharp end of the broken shaft of the whip in the countryman's face. Not apprehending any dangerous effects from the blows which he had received, the countryman, with his burden on his back, trudged along after his cart, which was loaded with wood, for nearly a quarter of a mile, till he arrived at the wood market, when he instantly dropped down dead.

Schmid was appointed to inspect the body. On examining the head externally, he found that the sharp end of the stick had penetrated at the inner canthus of the right eye. He endeavoured to ascertain with the probe whether the wound had reached the brain; but he could not, on account of the narrowness of the wound. Having opened the cranium, the brain and its membranes at first view appeared sound; but on raising the anterior part of the cerebrum, the nasal extremity of the falx was observed to be injured, and it was found that the wound had penetrated into the third ventricle, in which lay a considerable quantity of of clotted blood.[20]

Case 18.—A man, standing at the head of a horse which had fallen in the street, was suddenly struck in the face, upon the animal raising itself unexpectedly. The blow was so violent that he was thrown down by it, but not stunned. He was of opinion that it was not the head of the horse, but some part of the harness that had struck him. There was a bleeding wound between the left eye and the nose, about an inch long, dividing the lacrymal canal and palpebral tendon. A probe was introduced to the depth of three-quarters of an inch into the wound, in the direction of the inner wall of the orbit, but without the bone being felt. The left eye was uninjured. The right eye, without any perceptible injury, had entirely lost the power of vision. Its pupil was dilated to the utmost; and although its common sensibility, as well as its different motions, was perfect, a lighted candle held close before it, caused no contraction of the pupil, nor any sensation of light. The patient answered questions promptly and clearly, and evinced no symptom of injury extending to the brain, except that he complained of a little headache. The bones of the nose were examined, but no crepitus could be felt; neither was there any ecchymosis to indicate injury on the right side. Delirium, however, and stupor supervened on the following day; and as these symptoms were attributed to meningitis, the patient was bled, purged, and treated with repeated doses of calomel and antimony. In the evening, convulsions came on; the left arm and leg were stiff and contracted, while the right extremities were in constant motion; the pupil of the right eye was now found to be contracted. As the patient could no longer swallow pills, calomel was laid on the tongue; a blister also was applied to the nape of the neck. The left side and extremities became subsequently paralytic, while the right were tranquil. He died convulsed on the 5th day after the accident.

On dissection, the brain and its membranes were found loaded with vessels, and there was a copious deposit of lymph between the arachnoid and the pia mater, over both hemispheres. A large accumulation of serum, with purulent matter diffused in it, was present in both lateral ventricles. The whole lower surface of the anterior lobes was adherent to the dura mater, by means of coagulable lymph. The optic nerves being exposed, the right was seen to be torn completely through, or its ends joined only by delicate membrane, close to the foramen opticum. The base of the brain, from the medulla oblongata to the chiasma, was thickly covered with a layer of lymph, which obscured the roots of the nerves. In the posterior part of the right anterior lobe, close to the injured part of the optic nerve, and approaching to the anterior cornu of the lateral ventricle, the brain was bruised, softened, and ecchymosed. The cause of the laceration of the brain and tearing across of the optic nerve was found to be a fracture of the cerebral plate of the ethmoid bone, with part of the sphenoid forming the roof of the foramen opticum. The fractured fragment of bone was found loosely attached by dura mater to the fore part of the sella Turcica, above the right cavernous sinus. On introducing a probe into the external wound, it could be made to pass, by a slight degree of management, into the crushed part of the ethmoid, and to appear within the skull. It was evident, therefore, that the object by which the blow was inflicted, must have been pointed; that it entered the orbit, so as to strike the os planum, and force it inwards; and that the force being communicated at the same time upwards, the blow had the effect of fracturing the cerebral plate of the ethmoid, and lacerating the optic nerve on the opposite side.[21]

Case 19.—On the 20th December 1819, I assisted at the examination of the body of a man who, the evening before, had instantaneously dropped down dead in a scuffle on the street, after receiving a penetrating wound of the orbit, with the pointed end of an umbrella. Considerable bleeding had taken place from the nose and mouth. The upper eyelid was swollen and livid, and the conjunctiva elevated by extravasated blood. Just over the tendon of the orbicularis palpebrarum, a penetrating wound easily admitted the little finger to the bottom of the orbit, between its nasal side and the eyeball. A fracture of the orbit was felt with the end of the finger. On opening the head, much dark fluid blood was found effused into the cavity of the tunica arachnoidea, and some between it and the pia mater. The dura mater was seen to be perforated by a lacerated wound, just under the edge of the boundary of the middle fossæ of the basis of the cranium, formed by the little wing of the sphenoid bone. The brain behind the wound of the dura mater was lacerated, and a small portion of it separated from the rest. On removing the dura mater, the fracture, which had been seen, indeed, immediately on lifting the brain, was displayed completely to view. The little wing of the sphenoid was separated by the fracture from the frontal bone, in the course of the sphenoidal suture. The fracture extended through the orbitary plate of the frontal from behind forward for about half its length; but what was much more remarkable, the comparatively thick and strong portion of the sphenoid, which completes the posterior part of the roof of the orbit, was broken across at its inner extremity; proving, along with the state of the dura mater and brain, the great degree of force with which the instrument of death had been driven against the hapless victim of a drunkard's fury. I may mention, that the optic nerve and eyeball were entire, the cornea clear, and the humours and retina uninjured.[22]

3. *Hæmorrhage.* Although hæmorrhage, more or less profuse, must attend all accidents of the kind now under consideration, I know only of one recorded case, in which a fatal result was to be ascribed entirely to the loss of blood.

Case 20. — In a scuffle, a nailer drew a red-hot iron nail-rod from the fire, and thrust it against the eye of a man, aged 28 years, who immediately fell heavily, and remained insensible for a short time; but, after having been carried home, became quite conscious, and vomited a large quantity of blood. When Dr. Little saw him next morning, he found a trifling wound of the left upper lid, immediately under the internal orbital angle of the frontal bone, not presenting any of the characters of a recent burn, and already united. The lid was swollen and black from ecchymosis, and was closed over the eye, which was intact and uninflamed. The face was pale, voice weak, and general aspect that of a person who had lost a large quantity of blood. Pulse 50, full, soft, and regular. His intellect continued unaffected, and he had a desire for food. Pupils regular and contractile. He was purged, and on the second day after the accident was bled at the arm on account of headache. On the fourth day, he began to void his urine in bed, and lost the power of his left leg, and partially of his left arm. Till the fourteenth day, he seemed to improve; his pulse steadily at 50; he was free from pain; his mind active; his appetite keen; but still passing urine involuntarily, and his left extremities paralytic. On that day, he was seized with a violent and sudden epistaxis, evidently arterial, immediately after which coma supervened, and in three hours he was dead.

The dura mater and subjacent arachnoid were perfectly normal. No serum in the ventricles. On raising the anterior lobes of the cerebrum, a large clot of blood, about three ounces in weight, was found lying on the orbital plate of the frontal bone. On removing this coagulum, an oval breach, with sharp and ragged edges, and about half an inch in its longest diameter, was exposed, involving the orbital plate of the frontal bone and cribriform plate of the ethmoid, and terminating at the side of the crista galli. Not a drop of matter had been formed, either within the skull or in the course of the wound, which had quite healed externally. The vessel from which the fatal hæmorrhage had issued could not be discovered. Dr. Little thought it probable, that it had been the anterior artery of the cerebrum, and considered that the same vessel had given origin to the blood which the patient had swallowed and afterwards vomited, and, either by the separation of a slough or the disengagement of a coagulum from its orifice, had finally caused death.

There are many remarkable circumstances about this case. The permanent pulse of 50; the occurrence of paralysis on the 5th day, without any new symptoms directly affecting the head; the contemporaneous improvement in the general state of the patient up to the day of his death; the freedom of the brain from injury; the absence of inflammation; and the cause of pressure, as detected on dissection, existing on the same side as the paralysis; all deserve particular attention.[23]

4. *Suppuration — Convulsions.* The cases which I am now about to quote, serve at once to confirm what is proved by some of the preceding ones, namely, that at the first there may be nothing alarming, except the suspicious situation of the wound; exemplify a symptom which has ever been regarded as an exceedingly dangerous, if not fatal, one in injuries of the brain, namely, convulsions; and illustrate, in accidents of this kind, both the date and the effects of suppuration. The earliness with which matter is formed by the tunica arachnoidea, in cases of wounded brain, is strikingly proved by the case already quoted from Sir G. Ballingall's Clinical Lecture.

With regard to the convulsions arising from irritation of the brain, and which not unfrequently appear immediately or very soon after a severe injury of the head, it may be observed, that they are probably the effect rather of pressure from fractured pieces of bone or effused blood than of any change in the cerebral structure, and are attended with comparatively less danger than those caused by disorganization consequent on inflammation. The latter usually occur along with strabismus and coma, some time after the setting in of the symptoms called *secondary*, from their occurring days or weeks after the injury, and are almost invariably the forerunners of death.

Case 21.—A soldier was brought to the hospital at Brest, at eleven o'clock in the evening, having been wounded with a pitchfork, at the middle of the left upper eyelid. The wound was oblique, about three lines in length, and appeared to implicate only the skin and orbicularis palpebrarum; there was very little blood discharged; the eyelid was distended, and the conjunctiva inflamed. The apparent simplicity of the wound, the goodness of the pulse, and the free exercise of all the functions, led to a favourable prognosis; the patient asserted that he had experienced nothing particular at the moment of the injury, and had scarcely been stupified by it. Compresses dipped in brandy and water were applied over the wound. The patient rested during the night; next day, he was quite lively, walking about in the wards, complaining only of slight pain in the wound, and even eating with appetite. The same day, at seven in the evening, he was seized with convulsions, which were supposed by his attendants to be epileptic. The day after, he was kept from food, and bled at the arm; the convulsions returned, and he was bled at the foot. Vomiting, uneasiness, agitation, and delirium came on; the pulse became small and contracted; cold sweats succeeded, and the patient died at two o'clock next morning.

On dissection, the eyelids were found œdematous, and the wound had already closed. On cutting through the upper eyelid and orbicularis palpebrarum, a circumscribed collection of pus was found in the orbit, between its roof and the levator palpebræ superioris. This collection of pus communicated with the cranium, through the orbitary plate of the frontal bone, which had been penetrated by one of the prongs of the fork. After removing the eyeball, the inferior wall of the orbit was found fractured, and depressed almost completely into the maxillary sinus. This fracture is compared by M. Massot, the narrator of the case, to the depression which might be produced on the surface of an egg, by pressing it inwards with the thumb. On removing the calvaria, the dura mater was seen to be penetrated over the hole made by the fork in the roof of the orbit. The dura mater appeared in a morbid state at that place, the anterior fossæ of the basis of the cranium were covered with pus, the anterior lobes of the cerebrum were in a state of suppuration, and the rest of the brain healthy. M. Massot thinks it probable that, when the fork was pushed through the orbit into the cranium, the eyeball being fixed and violently pressed between the fork and the floor of the orbit, the thin plate of the superior maxillary bone could not resist this pressure, but sunk by the continued action of the fork upon the eyeball.[24]

5. *Palsy.* Wounds penetrating the upper or inner side of the orbit are sometimes productive of paralytic affections, from the effusions of blood within the cranium to which they give rise. The palsy is generally, but not always, on the opposite side of the body to that which has been injured. The upper and lower extremity, and the sphincter of the bladder, are most apt to be paralysed. The paralytic affection sometimes occurs instantly after the injury; in other cases, not for several days. The effusion of blood ceasing, the patient may survive; and slowly, as the blood is absorbed, the palsy may disappear. The effusion continuing, or being renewed, after having ceased for a time, coma and death are likely to supervene.

Case 22. The son of Gen. E., a student at the Polytechnic School in Paris, received, in fencing, the end of the foil through the roof of the orbit, and became hemiplegic on the opposite side of the body. The eye was saved.[25]

Case 23.—Thomas Hale, aged 35, was assisting in hay-making. A scaffolding had been erected at the side of the hayrick; and while his companion, a man named Joslyn, was in the act of throwing some hay upon it, the pitchfork missed the hay, and struck Hale in the right eyebrow. Instead of drawing the pitchfork out, Joslyn, under the impression that he had caught the hay, thrust it farther in, the one prong entering Hale's orbit, while the other glanced over the outside of his head.

When the prong was withdrawn, which was accomplished with difficulty, Hale turned to leave the field, having the impression that his eye had been driven out of his head; but he had not proceeded more than five or six yards before he fell, his left side crippling under him. In other respects he recovered; but the palsy continued, the fingers of the left hand being contracted, and the left foot swinging about, although he became able, in the course of some months, to walk at the rate of a mile in 30 minutes. Dr. Roe, who published[26] the case, had given a trial to strychnia internally, and to electro-magnetism, without any very striking improvement. Hale continued to taste, smell, and see as well as ever.

Case 24.—A case of this kind is also recorded by Mr. Geach.[27] He does not, indeed, say that the wound penetrated into the brain, but merely that the instrument of injury struck against the inner side of the orbit; leaving it a matter of doubt whether the paralytic symptoms which followed, were attributable to effusion within the cranium, or to a still more direct injury of the brain. The instantaneousness with which the patient, in this case, fell on receiving the injury, looks very like the effect of a wound of the brain; while, on the other hand, the slowness of the pulse and the hemiplegia, are more the symptoms of pressure from effused blood. Even, however, on the supposition that the small sword with which the wound was inflicted, had not penetrated through the ethmoid bone into the brain, the case becomes only the more remarkable; as it would lead us to conclude, that a wound of the bones of the orbit, without perforation, might be attended by rupture of vessels within the cranium, and consequently with pressure on the brain, and paralysis. At the time when Mr. Geach drew up his account of the case, the paralytic arm and thigh were recovering, but slowly, their power of flexion and extension.

6. *Foreign body still in the orbit.* In all the instances to which I have hitherto referred, the weapon, whatever it was, was instantly withdrawn on the injury being inflicted; but we must be prepared to meet with cases where the foreign body which has been driven through the walls of the orbit, still remains in the wound.

In such cases, we instantly proceed to its removal; for there very soon follows such a degree of swelling as might prevent us from accomplishing the extraction without great difficulty, if at all: and were the weapon left, what could we expect but destructive inflammation of the eyeball, of the orbit, of the surrounding parts, and, among these, of the brain?

Case 25.—A labourer thrust a long lath, with great violence, into the inner canthus of the left eye of another labourer. It broke off quite short, so that a piece nearly two inches and a half long, half an inch wide, and above a quarter of an inch thick, remained in his head, and was so deeply buried that it could scarcely be seen, or laid hold of. He rode with the piece of lath in him above a mile, to Barnet, where Mr. Morse extracted it with difficulty; it sticking so hard, that others had been baffled in attempting to remove it. The man continued dangerously ill for a long time; at last he recovered entirely, with the sight of the eye and the use of its muscles; but even after he seemed well, upon leaning forwards, he felt great pain in his head.[28]

In the days when javelins and arrows formed principal weapons of war, many difficult cases of this sort must have occurred. Albucasis shortly relates two which had come under his care. In the one, an arrow entered at the nasal side of the orbit, and was extracted under the ear. The patient recovered, without any permanent injury of the eye. In the other case, a Jew was struck with a large unbarbed arrow from a Turkish bow, under the lower eyelid. It had sunk so deep that Albucasis reached with difficulty the end of the iron, where it stuck upon the shaft. This patient also recovered without any serious effect.[29]

Very great force may sometimes be necessary for extracting a foreign body, which has been driven through the walls of the orbit.

Paré's successful case[30] is well known, in which he was obliged, with a pair of farrier's pincers, to tear away from the Duke of Guise the broken end of a lance, which, entering above the right eye, and towards the root of the nose, penetrated as far as the space between the ear and the nape of the neck, tearing and destroying vessels and nerves in its course, as well as fracturing the bones.

Case 26. — Percy had under his care a fencing-master, who in an assault received so furious a thrust from a foil on the right eye, that the weapon penetrated nearly half a foot into the head, and broke short. The man fell down in a state of insensibility, and very soon the supervening swelling was so great as to conceal the foreign body. In order to lay hold of it, Percy opened and evacuated the contents of the eyeball. His forceps not being strong enough, he sent to a clock-maker in the neighbourhood, and borrowed from him a pair of screw-pincers, with which he laid hold of the broken end of the foil, and thus succeeded in extracting it. The fencing-master died some weeks after, more from the consequences of intemperance than of the injury.[31]

Commenting on this case, Percy recommends, that we should rather remove the eyeball, than leave large foreign bodies in such a situation; and refers, in support of this practice, to a case related by Bidloo, in which a splinter of wood was left to come away from the orbit by suppuration. The eye burst at last, after the most dreadful pain and after the other eye had been threatened with destructive sympathetic inflammation.

Case 27. — Sabatier notices[32] an instance of wound with a knife, through the upper eyelid, with injury of the neighbouring edge of the frontal bone. It was not, he says, till after four hours' work, that the surgeon succeeded, by means of a hand-vice, in tearing away the portion of the knife-blade which remained in the orbit, on account of its projecting so little from the wound. The patient complained of severe pain, as if one had been tearing out his eye. No ill consequence followed; the cure was speedy, and without any affection of sight.

7. *Dangers after foreign body is removed.* We must not imagine that, on withdrawing the foreign body from the orbit, the danger is over. Destructive inflammation of the eye, or even fatal inflammation of the brain, may follow, as in the case I have just quoted from Percy: nay, the patient has been known suddenly to expire, immediately after the foreign body was removed.

Case 28. — A labourer, aged 51 years, while cutting wood in a forest, stumbled over the root of a tree, and with the whole weight of his body drove the end of a file, which be held in his hand, against his left eye. The file broke across, and a portion of it remained in the orbit. The patient was carried, in a state of insensibility, to a small town some miles off, where three surgeons tried by turns, but in vain, to extract the foreign body, which, with the probe and the forceps, they felt distinctly, through the wound, beneath the middle of the eyebrow. They enlarged the wound with the knife, and during three days made reiterated attempts at extraction; but the foreign body continued immovable.

On the 4th day, the patient was brought to the surgical clinic at Prague. The eyelid was greatly swollen, and in the middle of it there was a triangular wound, with inverted edges. The eyeball was motionless, and was so pushed downwards and outwards that it almost lay on the cheek, carrying the lower eyelid before it. The cornea presented a more than ordinary degree of lustre. The patient was nearly comatose.

Fritz endeavoured, by means of strong pincers and polypus-forceps, to withdraw the foreign body, but these instruments bent under the pressure. At last, with a pair of small but very strong lithotomy-forceps, which he grasped with both his hands, he succeeded in extracting the piece of the file. It was triangular, measured an inch and a half in length, and was denticulated to its point, which was blunt.

The patient answered questions very slowly, or not at all; his face was pale and sunk, his eyes were shut, and he lay motionless, except that he often raised his left hand to the left side of his head. Respiration slow; pulse oppressed and hard. The wound gaped widely; the eyelid, almost completely divided into lateral halves, was of a dark red colour, and so much swollen as to allow only a small portion of the displaced eyeball to be seen.

Notwithstanding the repeated use of venesection and of leeches, and constant cold applications to the eyes, the cornea filled with pus, and giving way about the 12th day, allowed the iris to protrude. The cornea was ultimately left in an opaque and atrophied state. The wound suppurated abundantly, and for some time a probe could be passed along it, in a direction backwards and inwards, beneath and through the orbitary portion of the frontal bone, to the depth of five inches, without causing pain. At length the wound closed, the upper eyelid remaining palsied. The patient's general health was perfectly restored.[33]

Case 29.—A girl, 10 years of age, playing along with other children, near a cotton-spinning machine, fell upon one of the pointed iron spikes, 5 or 6 inches long, on which the bobbin is placed. This instrument penetrated to the depth of about 2 inches into the orbit, between the inner wall and the globe of the eye, and then broke across, so that 2 or 3 lines' length of it projected above the level of the skin. Attempts were made to remove it; but so much difficulty was experienced, that these attempts were not persisted in. Ten days afterwards the piece of iron was found protruded to the length of 9 or 10 lines; a month afterwards, it was still more protruded; in fact, it now held apparently so slightly, that it was laid hold of with the fingers and extracted. Scarcely had this been done, when the child was seized with convulsions, and died in a quarter of an hour. The sight had not been affected during the residence of the foreign body in the orbit, nor had its presence there excited any very marked symptoms. The child had always been able to go about.[34]

8. *Eyeball dislocated.* It is important to observe that mention is made by different surgical authors, of the eyeball being dislocated, or pushed out of its socket by a foreign body thrust into the cavity, or traversing the sides of the orbit. Now, in such cases it is necessary not only to remove the foreign body, but to reduce the eye. This has sometimes been done with complete restoration of vision.

By being dislocated, or pushed out of its socket, is to be understood, that the eyeball is extruded beyond the fibrous layer of the eyelids; that layer which is a continuation of the periosteum, and lies beneath the orbicularis palpebrarum. Of course, the optic nerve must be put on the stretch by such an accident, and the eyelids can no longer be made to close upon the protruded eyeball.

Case 30.—Mr. B. Bell relates a case, in which the eye was almost completely turned out of its socket, by a sharp-pointed piece of iron pushed in beneath it. The iron passed through a portion of the orbit, and remained firmly fixed for the space of a quarter of an hour, during which period the patient suffered exquisite pain. He saw none with the dislocated eye; and the protrusion being so great as to lead to the suspicion that the optic nerve was ruptured, Mr. Bell doubted whether it would answer any purpose to replace it. He found, however, on removing the wedge of iron, which, being driven to the head, was done with difficulty, that the power of vision instantly returned, even before the eye was replaced. The eye was now easily reduced to its original situation; inflammation was guarded against, and the patient enjoyed perfect vision.[35]

9. *Undetected wounds of orbit—Foreign body not removed.* The foreign body, by which a wound of the orbit has been inflicted, has in some cases been left unremoved, from the fact of its presence not having been suspected, or from the surgeon not having instituted a sufficiently strict examination of the wound with the probe; while, in other cases, it has been left in the orbit, or within the cavity of the cranium, from an impossibility of removing it with safety.

The recorded instances of foreign bodies, driven through the orbit by mere manual force, and left within the cavity of the cranium, are but few. Numerous cases of gunshot wounds, however, in which the ball or other foreign body was left within that cavity, are recorded; and it is evident that the effects, so far as the mere presence of the foreign body is concerned, must be much the same, whether it has passed through the orbit into the brain by manual or by explosive force. Death, under such circumstances, is almost certain to be the result, either immediately or in the course of a few days; although some remarkable cases have happened, of extraneous bodies lying for years in the very brain itself, without causing any apparent inconvenience.[36]

Case 31.—A lieutenant in a Highland regiment, running in a dark night to escape a shower of rain, came in contact with an irritable old man, who made a thrust at him with an umbrella, the point of which struck him immediately beneath the left eyebrow. The wound was attended with so little pain or shock to the system, that the gentleman walked a distance of at least half a mile, to Sir Philip Crampton's house; and having mentioned the occurrence as one to which, however, he attached no importance, begged Sir P. to look at the wound on the eyelid, which still continued to bleed slightly.

Sir P. found a wound of about three-fourths of an inch in length in the upper eyelid, exactly in the seat of the fold formed in this part by the action of opening the eye, and looking up. When the eyeball was so turned, there was no appearance of wound; but when the eyelid was drawn downwards, the wound gaped and showed the conjunctiva, which still completely covered the upper portion of the ball of the eye. Vision was quite unimpaired. The wound having been united by two points of suture, the patient took his leave, and walked home. Sir P. called on him next morning, and found him at breakfast, making no complaint, but of some stiffness in the eyelid. Next morning at seven o'clock, Sir P. was called to him in a hurry, and found him in so strong convulsions, that it was with difficulty two persons were able to keep him from working himself out of bed. The convulsions continued, with short intervals of coma, till eight or nine o'clock in the evening, when he expired.

At the *post-mortem* examination, it was found, that the brass ferule of the umbrella, nearly two inches long, had penetrated the orbital plate of the frontal bone, and was lodged in the substance of the left hemisphere of the brain; it was imbedded in a thin coagulum of blood, which extended into the left lateral ventricle; both ventricles contained a small quantity of bloody serosity.[37]

As to foreign bodies which have not touched the brain, but merely passed through one or other of the sides of the orbit, and are left remaining, they give rise to more or less irritation, destroy the bones more or less extensively, take different routes for their escape, but, in most instances, appear to pass either through the maxillary sinus, or by the spheno-maxillary fissure into the fauces, and are discharged in very various spaces of time.

Case 32.—Marchetti had under his care a beggar, who, asking charity rather importunately one summer's day from a Paduan nobleman, this testy personage struck the beggar with the handle of his fan, in the inner angle of the eye, and with so much force, that a portion of the fan, three inches long, broke through the orbit, and sunk out of sight in the direction of the palate. When the man came to the hospital, Marchetti removed some small bits, which he found sticking in the angle of the eye, combated the inflammation, allowed the wound to close, and dismissed the patient as cured. In three months, he returned with a large swelling in the palate, which, when Marchetti cut into, his knife struck upon the handle of the fan, which he immediately extracted with a pair of forceps. The patient speedily recovered.[38]

Case 33.—Mr. White relates the case of a person, to whom it happened that, as he sat in company, the small end of a tobacco-pipe was thrust through the middle of the lower eyelid. It passed between the globe of the eye and the inferior and external circumference of the orbit, and was forced through that portion of the os maxillare which constitutes the lower and internal part of the orbit. The pipe was broken in the wound, and the part broken off, which, from the examination of the remainder, appeared to be above three inches, was quite out of sight or feeling, nor could the patient give any account of what had become of it. The eye was dislocated upwards, pressing the upper eyelid against the superior part of the orbit; the pupil pointed perpendicularly upwards, the depressor oculi was upon the full stretch, and the patient could see none with that eye. Mr. White applied one thumb above and the other below the eye, and after a few attempts at reduction, it suddenly slipped into its socket. The man instantly recovered perfect sight, and suffered no other inconvenience than that of a constant smell of tobacco smoke in his nose for a long time after; for, as he informed Mr. White, the pipe had just been used before the accident. About two years afterwards, he called upon Mr. White, to acquaint him that he had, that morning, in a fit of coughing, thrown out of his throat a piece of tobacco-pipe, measuring two inches, which was discharged with such violence, as to be thrown seven yards from the place where he stood. In about six weeks, he threw out another piece, measuring an inch, in the same manner, and never afterwards felt the least inconvenience.[39]

In illustration of the length of time which a foreign body may take in this way to escape, I may notice the following case, related in a letter to Horstius:—

Case 34. — A boy of 14 years of age was struck by an arrow, while amusing himself in his play-ground. It stuck fast in the orbit; but the boy pulled it out, and threw it on the ground. A surgeon arrived, to whom the playfellows of the boy who was wounded showed the arrow, deprived of its iron point. With a probe the surgeon attempted to examine the wound; but, on the boy fainting, he desisted, so that the iron point was left in the orbit. The external wound healed, and the boy recovered; the eye remained clear and movable, but deprived of sight. This happened in the beginning of August 1594, and nothing more was heard of the iron point, till October 1624; when, after an attack of fever and catarrh with a great deal of sneezing, it descended into the left nostril, whence, taking the way of the fauces, it came into the mouth and was discharged. During the whole thirty years and three months that it had remained in the head, it had not been productive of any pain.[40]

§ 8. *Incised Wounds of the Orbit.*

Sabre-wounds of the head have sometimes been attended by a cleaving of the orbit; and, in some rare instances, the orbit has been laid open, by an entire separation of part of its parietes, so as to expose its contents to view. The following cases illustrate this class of injuries of the orbit:—

Case 35. — Marchetti shortly states the case of a German soldier, who was wounded in the forehead, with a broad and heavy sword. The frontal bone and the brain were divided, down to the eyes, and the patient was immediately deprived of sight. In two months, he recovered from the wound, but continued blind, with the pupils clear.[41]

Case 36. — Edward Power received a desperate wound with a backsword, extending from the top of the frontal bone to the orbit of the left side, forming an extended and frightful chasm, in which were included the bone, membranes, and brain. The wound bled considerably, and was for nearly three hours exposed to the open air, the patient not having so much as a rag to cover it. Fever and inflammation of the brain might have been apprehended; yet by a couple of bleedings, and some other antiphlogistics, the man was completely cured in five weeks, without exfoliation, or the slightest operation.[42]

The following case shows the propriety of attempting union by the first intention, even when part of the osseous parietes of the orbit is completely separated by an incised wound:—

Case 37.—A young man received a wound with a cutting instrument, extending obliquely from the upper part of the left temporal fossa, across the root of the nose, to the right fossa canina. This wound divided the skin, the temporal branches of the portio dura, the anterior auricular muscle, part of the temporal muscle, orbicularis palpebrarum, and corrugator supercilii, the frontal branch of the ophthalmic nerve, and the superciliary artery. These parts hanging over on the cheek, formed a flap, in which were also present a portion of the orbitary arch of the frontal bone and its external angular process, so that a portion of the cavity of the cranium was laid open, as well as the cavity of the orbit, exposing to view the globe of the eye, and the motion of the brain. The nasal nerve and artery, the pyramidal muscles, and, to a small extent, the bones of the nose, were divided; from the nose to the right fossa canina, only the skin was divided. The portion of brain laid bare appeared unhurt; the eye also seemed perfectly sound, none of its parts having been touched, except the levator palpebræ superioris, which, having been cut across in the middle, presented its anterior half in a state of relaxation, and dragged downwards and forwards by the flap which lay upon the cheek.

The patient had neither experienced any concussion, nor become insensible; but, when M. Ribes saw him, was in a state of considerable depression. A surgeon, who had been called before M. Ribes arrived, had already dressed the wound. Perhaps, in imitation of Magatus, who directs in such cases that a plate of gold or lead, drilled through with holes, be applied over the dura mater, and that the edges of the wound be simply brought together, without supporting them by sutures, this surgeon had placed between the lips of the wound a bit of linen spread with cerate on both sides, in order to give vent to the suppuration, which no doubt would have followed; he had then brought the flap into its place, and supported it by a roller. M. Ribes removed the piece of linen, and brought the edges of the wound exactly together, retaining them by strips of adhesive plaister. In six weeks the patient was cured, without fever or suppuration.

The eye, however, which had been exposed, became blind, and the upper eyelid remained motionless. Ten years afterwards, the eye still preserved its form and transparency, but had shrunk in size. M. Ribes is of opinion, that the blindness in this case was a sympathetic effect, produced upon the retina by the division of the branches of the fifth pair. He regards the retina, not as a mere expansion of the optic nerve, but as a nervous membrane into which enter branches of the great sympathetic, and of the ciliary or iridal nerves, as well as the fibrils of the optic nerve; whence injuries of the great sympathetic, or of the fifth pair, may, he thinks, produce blindness, although in the first instance the optic nerve has not been affected.[43]

Although the separated piece of the orbit appears to have united in this case, it sometimes happens that only the soft parts unite, while the bones continue divided. Of this, we have an example in the following case, related by Dr. Hennen:—

Case 38.—An officer received, at the battle of Waterloo, a sabre-wound across the eyes, cutting obliquely inwards and downwards to such a depth as to admit of a view of the pharynx. One eye was destroyed; and the hiatus was so great, that it was necessary to support the upper jaw by morsels of cork put into the mouth in such a way as to act as fulcra, but admitting the passage of liquid nourishment. After the wound was dressed on the field, the patient was sent to Brussels, where he fell into the hands of a Belgian barber, who stupidly cut out the ligatures, removed the straps by which the lower portion of the face was kept in position, and stuffed the parts with charpie. This was not removed for several days, after which the parts were again brought into apposition by straps and bandages, but with great pain and consequent delirium. The patient recovered, granulations sprouting up at all points, and the soft parts uniting, but not the bones.[44]

§ 9. *Gunshot Wounds of the Orbit.*

Gunshot wounds of the orbit, and wounds caused by other explosions, present much greater variety in their direction than any other wounds of this part. They also vary much in the depth, extent, and effects of the injury which they produce.

1. *Exterior parts of orbit injured.* The superciliary ridge, and the other exterior parts of the orbit, are often the seat of gunshot injuries.

Sometimes a ball traverses the outer wall of the orbit. In other cases, the person bending forward at the moment of receiving the wound, the ball passes through the superciliary ridge, whence it generally descends through the floor of the orbit into the maxillary sinus, or into the nostril, destroying the eyeball in its course.

The frontal sinus, when much developed, separates the two tables of the orbitary plate of the frontal bone, so as to form a cavity in which musket balls have frequently been known to lodge. This is generally attended by depression of the inner table, so as to render necessary the operation of trepan.[45] The surgeons of former days refrained from trepanning these sinuses, partly from fear of an incurable fistula following the operation, partly from the difficulty of sawing through two plates of bone placed obliquely in regard to each other, without wounding the dura mater; but the fear of a fistula is now laid aside, and the second difficulty is in some degree obviated, by employing two trephines, a large one for the external, and a smaller one for the internal table. In this way, a depression may be raised, or a ball, fixed perhaps in the internal table, or in the roof of the orbit, may be removed.

Sometimes a ball has been left in the frontal sinus, whence it has slowly made its way.

Case 39. — The French General T. received a ball in the left orbit, at Waterloo. After lacerating the eyeball, it traversed the superior internal wall of the orbit, and lodged in the frontal sinus. It remained there for 12 years, without producing any remarkable effects, after which time the patient awoke one night with the sensation of something falling into his gullet. It was the ball, which he immediately coughed out.[46]

2. *Bones of orbit susceptible of re-union.* The bones of the orbit, shattered by a ball are still, in some cases, susceptible of re-union, and ought not, therefore, to be hastily removed, although they are felt to be loose after an injury of this kind. The copiousness with which all the parts of the face are supplied with blood, communicates to its bones a power of recovery, greater than that usually found in the osseous system.

Case 40. — Poneyes had under his care a soldier, in whom a musket-ball had shattered the anterior part of the frontal sinuses, the upper part of the bones of the nose, and the right orbit towards the inner angle. He fell instantly on receiving the wound, vomited soon after, became insensible, and bled at the nose. Poneyes removed the portion of bone forming the frontal sinuses, leaving the bones of the nose and the injured portion of the orbit loose. The posterior part of the frontal sinuses was not fractured. Delirium came on with drowsiness; but after the patient was repeatedly bled, those symptoms ceased. The loose pieces of bone re-united, and the cure was completed in two months and a half.[47]

3. *Different directions of projectiles through the orbit.* Balls passing directly backwards through the orbit, are generally fatal, from entering the brain; whereas, those which enter the orbit obliquely, though generally destructive of vision, either by striking the eyeball, or dividing the optic nerve, very frequently leaving the brain untouched. A ball passing transversely, or with only a slight degree of obliquity, through one or both orbits, proves fatal, if the cribriform

plate of the ethmoid is fractured, the shock communicated by the crista galli to the brain and its membranes being followed by cerebritis and meningitis.

Dr. John Thomson mentions a case, in which the ball entered nearly in the middle between the frontal sinuses, passed across the left sinus, and seemed to lodge in the cavity of the orbit, producing blindness, with great swelling of the eye, and of the parts surrounding it. In another case, where the bullet entered the face on the upper and left side of the nose, and passed out anterior to the right ear, the patient was affected with amaurosis of the right eye. The left eye was similarly affected, in a case where the ball entered the right side of the nose, and came out in front of the left ear. In one case, the ball entered at the inner angle of the left eye, and passed out in front of the left ear. In another, the ball entered above the inner angle of the right eye, and passed out of the right ear. In both these cases, the eye of the side on which the ball passed was destroyed. In one case, in which the ball entered the right eye, and passed out midway between the left eye and ear, the left eye was affected with amaurosis.[48]

Case 41.—Wepfer[49] has recorded the case of a person, accidentally shot by his fellow-traveller, while resting on the ground. The ball entered a little below the lobe of the right ear, and passing behind the angle of the jaw, above the roof of the palate, and behind the root of the nose, traversed the left orbit, and made its exit through the upper eyelid. The eyeball was forced from its place, so that it hung out of its socket, with the cornea in a state of laceration; and at the same time a portion of the frontal bone was separated from the rest of the orbit. Blood was discharged from both apertures of the wound, and from the nostrils and mouth; and for some days it flowed whenever the patient made any exertion. In the course of the cure, no pus came from the nose or mouth. The patient had no convulsions. He was always able to swallow, although at first he found it difficult to masticate, or to open his mouth. The right eye and the neighbouring parts were ecchymosed for a number of days.

From the aperture caused by the exit of the ball, laudable pus was copiously discharged; an abscess forming above the inner angle of the eye, an incision was made into it, above an inch in length, and kept open until some loose fragments of the frontal bone came away; after this it closed. At first the eyeball was not only extruded from the orbit; but the muscles, lacrymal gland, and fatty cellular substance were exposed to view. Pus was discharged, but not very copiously, from the orbit; the eye retreated into its place; and a thick fold of conjunctiva being removed with the scissors, the parts healed. Purulent matter was copiously discharged from the aperture near the angle of the jaw, which was kept open for 18 weeks, till some fragments of bone came away; after which the patient perfectly recovered, but with the loss of his eye.

Case 42.—At the battle of Pultusk, a cannon-ball striking and giving impetus to a bayonet, the latter penetrated the right temple of a soldier, at the distance of two fingers' breadth behind, and a little above the orbit; and taking a direction forwards and downwards, traversed the left maxillary sinus, whence it protruded to the length of 5 inches. The surgeon, on the field of battle, tried in vain to extract the bayonet; but a comrade, making him sit down on the snow, and putting his foot on the wounded man's head, drew it out with both his hands. The patient recovered in three months, with the loss of the right eye.[50]

4. *Balls traversing both orbits.* Many instances are recorded of balls passing through the orbits from temple to temple.

Case 43.—Heister relates[51] a case of this sort. The person recovered; only he became blind the very moment he received the shot, and remained so ever after. The entrance and exit of the ball were exactly in the angle which the zygoma makes with the process of the malar bone going up to join the frontal, and of course the ball must have passed through the posterior part of each orbit, probably dividing the optic nerve and the muscles of both eyes, without wounding either the eyeballs or the brain. The eyes appeared quite clear, and without inflammation, but fixed, and totally deprived of sight.

In such wounds, many different parts are exposed to injury; and by the subsequent effects, we may sometimes determine what structures have actually suffered. The outer and inner walls of the orbit will be reduced to splinters, and, perhaps, the cribriform plate of the ethmoid; the temporal muscle and its aponeurosis, numerous nervous filaments from the portio dura, and from the three divisions of the fifth nerve, and numerous branches of the external and internal maxillary artery, will be divided; while the nerves within the orbit, as well as the muscles of the eye and the branches of the ophthalmic artery, will suffer more or less severely.

A gunshot wound which traverses both orbits, must be regarded as less dangerous than one in which the ball does not pass so directly across from one side of the head to the other; but either from being directed backwards in its course, enters the brain, or from its force being partially spent, lodges among the bones. Speaking of the wounded before Mons in 1709, Heister states, that, for the most part, those who had received a wound only in one temple, died either immediately, or soon after.

Dr. Thomson tells us, that he saw from eight to ten patients, after the battle of Waterloo, in whom musket-balls had passed behind the eyes from temple to temple. In all of them, there was great swelling, pain, and tension of the head and face. He mentions, that a careless examination would have led one to suppose, that in these cases the balls had entered the cavity of the cranium; and remarks, that cases of this kind are recorded, in which the blindness which followed is supposed to have been produced by the balls injuring the inferior part of the anterior lobes of the brain: but that, most probably, in such cases the brain is untouched.

In one case observed by Dr. Thomson, where the ball had passed behind the eyes from temple to temple, one eye was destroyed by inflammation, and the other affected by amausosis. In another case, where the ball had taken precisely the same direction, both eyes were affected with amaurosis, without any inflammation being produced. He remarks, that in some of the patients in whom amaurosis had followed, there was reason to believe, from the course which the balls had taken, that the optic nerves were divided; but that in a considerable proportion of those so affected, it was obvious that the balls had not come into contact with those nerves. Various instances also occurred, in which the bullet, penetrating through both eyeballs, had passed behind the bridge of the nose, and left it unbroken. In one of the cases, in which the ball had passed below and behind the eyes, the patient was affected, at the end of some weeks, with painful spasms in the face, which, in their severity and mode of attack, bore a resemblance to tic douloureux.[52]

Case 44.—A case by Valleriola is often quoted[53], of a soldier through whose head a ball passed from temple to temple, entering by the left, and coming out a little higher on the right side. Apoplectic symptoms followed, from which he recovered; but he remained blind and deaf.

Case 45.—In one of the engagements between the French and the Algerines in 1830, a French corporal received a ball through the orbits. It entered an inch behind and six lines above the external angular process on the right side, and came out at the point diametrically opposite. The patient presented symptoms of concussion of the brain, and Dr. Baudens[54] was of opinion that the anterior and inferior surface of the cerebrum was injured. Although gunshot wounds are not in general attended by much hæmorrhage, the patient, in this instance, was covered with blood, which flowed from the temples, and still more from the nostrils. When he arrived at the ambulance, he was in a state of syncope, which served to arrest the bleeding. The face was considerably swollen, and especially the naso-orbitary region.

The splinters were removed; the wounds were washed, dressed, and covered with large compresses wrung out of cold water. These were continued for six days, as well with the view of preventing inflammation within the head, as of retarding the flow of blood. Dr. Baudens did not wish to arrest the bleeding altogether, as it contributed, he thought, to the safety of the patient. During the first fifteen days, there was occasional delirium; but this symptom was moderated by cold applications to the head, along with the abstraction of blood by cupping between the shoulders. A multitude of small maggots formed in the orbits and nostrils. Fearing they might penetrate to the brain, Dr. Baudens destroyed them by a weak solution of corrosive sublimate.

Among the effects of this injury, the following are particularized by Dr. Baudens. A feather pushed into the nostrils produced no sensation, but any sharp body was distinctly felt. This organ, although not entirely deprived of sensibility, was not affected by any annoying itchiness from the presence of the maggots. The corneæ became opaque, and were destroyed, so that the eyes sunk. The sense of smell was lost, and the sensibility of the palate was blunted. The intellect was weakened. The patient preserved the memory of what had happened to him previously to the injury; but, after this, not even the incidents of the evening could be recalled on the following morning. He was not aware of the extent of his misfortune, and still cherished the hope of being restored to sight. The wounds were citratized two months after the receipt of the injury.

5. *Balls sometimes extracted from the orbit; in other cases left unremoved.* A ball which has penetrated through one or other of the sides of the orbit, may, in some cases, be detected and extracted. In other cases, it cannot be extracted, nor its course ascertained; so that, if the individual survives, it must be left to make its way out by the fauces, or by some other route.

Even grains of small shot, traversing the walls of the orbit, or fixing in them, should be traced, and, if possible, extracted. Left in the substance of the bones, they are apt to give rise to exostoses. In those cases in which a musket-ball is left, we must lay our account with long-continued and severe pain, caries, exfoliation of the bones, deep-seated formations of matter, sloughing of the mucous membranes, puffy swellings on the surface towards which the ball is approaching, and a very tedious recovery. Sinuses form, in such cases, before the ball makes its exit, and continue after it has escaped; and to dry them up is generally attended with danger. We must wait till the parts within have become healthy, and then the sinuses will close of themselves.

Case 46.—Dr. Hennen mentions[55] the case of a soldier, who was brought to him some weeks after being wounded, for the purpose of having a ball extracted, which gave him excessive pain, impeded his respiration and deglutition, prevented his speaking distinctly, and kept up an irritation in his fauces, attended with a constant flow of saliva, and a very frequent inclination to vomit. On examination, it was found to be lodged in the posterior part of the fauces, forming a tumour behind, and nearly in contact with the velum pendulum. It had passed in at the internal canthus of the eye, fracturing the bone. Although blindness was the instant effect, the globe of the eye was not destroyed; and the remaining cicatrice, and the very inflamed state of the organ, were the only proofs that an extraneous body had passed near it.

Case 47.—One of the most remarkable cases of a ball penetrating through the orbit, and making its way out of the head, is that of Dr. Fielding, who was shot at the battle of Newberry, in the time of the Civil Wars. The ball entered by the right orbit and passed inwards. After 30 years' residence in the parts, and a variety of exfoliations from the wound, nose, and mouth, and the formation of several swellings about the jaw, it was at last cut out near the pomum Adami.[56]

Case 48.—A soldier of one of Napoleon's armies was struck just above the left orbit by a musket-ball; but, as a fellow-soldier fell dead at the same time by his side, he believed the ball had rebounded from his own head and killed his comrade. For more than 24 years he was subject to violent pains in the left eye, and in the head; and this eye projected much from the orbit. The surgeons under whose care he was placed from time to time, believing his story of the rebounding of the ball, afforded him little or no relief. In 1837, he came to the hospital at Verona, when Dr. De Borsa, on examining the case, came to the conclusion, that the projection of the eye, which commenced soon after the accident, could be caused only by the persistence of the foreign body in the orbit, as any exfoliation of bone which the blow might have occasioned, would, in the course of so many years, have been discharged or absorbed.

A portion of bone was, therefore, removed from the orbit by the trephine. The track of the ball was found ossified, excepting at a small aperture, whence issued from time to time a little fluid. After the bone was removed, the ball was felt, by means of a probe, at the back of the orbit, and extracted by means of a forceps. The eye now retreated into the orbit, and, after some weeks, became atrophic. The violent pains were quite relieved, and the patient lived for five years, to die then of pleuro-pneumonia. On examination it was found that the cranial cavity had not been penetrated by the trephine; but opposite to where the bone had been removed, was a deposit of osseous substance.[57]

6. *Balls or other foreign bodies, passing through the orbit, left within the cranium.* Although it generally happens that gunshot wounds of the orbit, penetrating into the brain, prove immediately mortal, yet in some rare cases, the ball or other foreign body has been known to remain within the cranium for a length of time, without producing much disturbance.

Case 49.—Petit related in his lectures the case of a soldier, who received a musket-shot in the inner angle of the eye. It seemed a very simple wound, and healed under the common hospital treatment. The man thinking himself cured, determined to leave the hospital, although advised by the surgeon to remain some time longer. Scarce had he reached the door when he was seized with rigors, obliged to return, and died in two days. On dissection, the ball was found lodged under the sella Turcica and optic foramina. An abscess was present in the brain.[58]

Case 50.—Dr. Hennen mentions[59] the case of a French soldier, wounded at Waterloo. The ball entered the right eye; the left, though not in the slightest degree injured to appearance, became completely blind. Dr. H. felt under the zygoma, and all along the neighbourhood of the wound, but in the puffy state of the parts could not detect the course of the ball. The patient himself was confident it had gone into his brain. He returned to France convalescent.

In contrast to the cases, in which a very small injury of the brain, through the orbit, has been followed by instant death, may well be placed those, in which such a substance as the breech of a gun, a piece of iron measuring upwards of three inches in length, and weighing more than three ounces, has been projected through the frontal bone into the brain, and been extracted, in one case, two months, and in another, twenty-seven days after the accident. In the first of the cases referred to, Mr. Waldon's, the roof of the orbit seems to have been destroyed; as through it one of the screw-pins of the lock was extracted. The patient died three days after the extraction of the breech from the brain.[60] In the second case, Dr. Rogers's, the patient recovered with the loss of an eye.[61]

7. *Balls or other foreign bodies passing through the orbit, and at the same time traversing the brain; loss of substance of the brain, in gunshot and other wounds of the orbit.* The effects of such wounds must, in general, be similar to those described in the following case by Wepfer, in which it is surprising that death did not ensue more speedily. Still more remarkable are those instances, in which gunshot and other explosive wounds, traversing the orbit and the brain, have been followed by recovery.

Case 51.—A huntsman, says Wepfer[62], holding the upper end of his gun with his hand, accidentally touched the trigger with his foot. The piece went off, and two balls entering by the right side of the lower jaw, traversed the left orbit, and made their exit through the left parietal bone, near the lambdoid suture. The left eye was driven from its orbit. The patient's mind seemed entire, and he moved all his limbs till the close of the 4th day. At that time he began to sing; but an hour or two before death, his speech became indistinct, although he still testified by nods that he understood what was said to him. He began to toss about his arms, as if in pain; short fits of a convulsive kind came on; he raved during the night; and died on the 5th day. During life, a copious ichorous discharge took place from the aperture in the jaw. On dissection, the course of the ball through the brain was traced from the parietal bone to the back of the orbit, and was observed to be filled with the same sort of ichor as had flowed from the jaw during life.

The following case of recovery from a gunshot wound traversing the orbit and the cranium, in several respects resembles Mr. Cagua's case of fractured orbit, referred to at page 4:—

Case 52.—A lad of 17 years of age was wounded by a musket-ball, which passing from below upwards, penetrated through the upper lip, the right nostril, and the roof of the orbit into the cranium, whence it escaped at the upper part of the frontal bone near to the sagittal suture, where it made a large wound of the integuments, with loss of substance. Such a degree of swelling came on as made the head frightful.

An incision was made over the wounded part of the orbit, whence, at the first dressing, there came out a portion of both substances of the brain, in bulk about the size of a small hen-egg. The eye was exceedingly swollen, especially the upper eyelid, into which an incision was made, to give issue to the blood which was supposed to be there extravasated; but, instead of blood, there came out a splinter of bone and a portion of both substances of the brain, nearly equal to a third of the portion which had formerly come away. The wounds were dressed lightly, and the patient was repeatedly bled. Some small portion of brain was again discharged. On the 4th day, the brain appeared to be in a state of suppuration; and on the 5th, the discharge became very considerable. From the time that he had been bled, the patient continued pretty well till the 11th day. Next day he was more feeble. On the 13th day, the matter from the brain which had been discharged both from the wound above and from that below, was in part retained, and the patient fell into a state of drowsiness and general depression.

M. Bagieu, who treated the case, having anew examined the wounds with minute attention, removed a large piece of loose bone from the upper part of the skull. The patient did not appear to be relieved by this, but became worse till the 15th day, when every one expected him to die. M. Bagieu remarked, that on pressing the skin where he had removed the piece of bone, pus oozed out, which made him suspect that there was an accumulation of matter at that place. Led by this idea, he removed the skin, and some portions of dura mater, so as freely to re-establish the discharge. The pulse rose, the patient was next day able to speak, and afterwards the suppuration slowly subsided. About the 19th day, the fleshy parts began to granulate, and the wound on the upper part of the head was soon covered over. It was otherwise with that of the eyelid, where supervened a considerable fungus, occasioned by the splinters separating from the neighbouring bone. In spite of cutting and burning this fungus, it was found necessary to wait patiently till all these splinters had come away; after which the excrescence was easily destroyed, the wound closed, and the patient recovered completely.[63]

Still more remarkable, in some respects, are the two following successful cases: —

Case 53.— Nicholas Joseph Brune, aged 17, wishing to unload a musket, began by extracting the balls with the common screw used for that purpose, but was foiled in attempting to remove the paper and the powder. He tried in vain to make the piece go off, priming it repeatedly for that purpose. At last, he resolved to bring the thick end of the ramrod to a strong heat, and introduce it into the barrel of the gun. The instant this was done the powder exploded, and the ramrod was driven against the inner part of Brune's right orbit, where the os unguis is united to the nasal process of the superior maxillary bone. Directing its course upwards and backwards, it came out by the right side of the superior angle of the occipital bone, to the length of ten inches.

On hearing the explosion, the father in terror ran to the assistance of his son, who had fallen to the ground. He instantly raised him, and seizing the thick end of the ramrod with both his hands, drew it out of his head. About two ounces of blood flowed from the two openings, whence escaped also some portions of brain. A surgeon dressed the wounds, enjoined abstinence, but did not bleed. No bad symptoms occurred, except that the right eye became violently inflamed, and was lost. A considerable quantity of pus came from the wounds, and between the 36th and 52nd days, some small exfoliations were discharged. Three months after the accident, the cicatrization was complete.

Professor Ansiaux afterwards repeatedly examined the patient, and exhibited him to his pupils. His health was perfect, and he was able to labour at hard work.[64]

Case 54.— Phineas P. Gage, 25 years of age, was charging with powder a hole drilled in a rock, for the purpose of blasting. It is customary in filling the hole to cover the powder with sand. The charge having been adjusted, Gage directed his assistant to pour in the sand; and at the interval of a few seconds, his head being averted, and supposing the sand to have been properly placed, he dropped the iron bar as usual upon the charge, to consolidate it. The assistant had failed to obey the order; and the iron striking fire upon the rock, the uncovered powder was ignited, and an explosion took place. Gage was at this time standing above the hole, leaning forward, with his face slightly averted; and the bar of iron was projected directly upwards through his head, and high into the air. The wound thus received, was oblique, traversing the cranium in a straight line from the angle of the lower jaw on the left side to the centre of the frontal bone above, near the sagittal suture. The iron weighed 13¼ lb.; it was 3 feet 7 inches in length, and 1¼ inch in diameter. The end which entered first was pointed, the tapering part being seven inches long, and the diameter of the point ¼ inch; circumstances to which perhaps the patient owed his life. It was picked up at a distance of some rods from the patient, smeared with brains and blood.

Notwithstanding considerable hæmorrhage and loss of cerebral substance, the patient recovered in the space of about two months, the left eye remaining amaurotic, and incapable of being turned outwards or upwards, and the upper eyelid in a state of ptosis. In the course of the cure, there occurred no signs of compression, concussion, nor inflammation of the brain.

The case was treated by Dr. Harlow, and is ably commented on by Professor Bigelow.[65]

8. *Part of the orbit shot away.* The temporal angle of the orbit is peculiarly exposed to this accident. Occasionally a considerable portion of the face, along with the lower edge, or the floor of the orbit, is destroyed; and yet recovery may follow. Even the roof has been so shattered, that it required to be removed; yet life has been preserved.

Case 55.—Captain M. aged 38, a French officer engaged against the Algerines, was wounded by a musket-ball, on the 1st of April 1836. It entered at the lower external part of the base of the orbit, and came out behind the ear, carrying away the malar bone, with the exception of a part of its superior surface, and of its superior and inferior angles, which, notwithstanding their being quite loose, Dr. Baudens[66] did not remove. All the soft parts, as far as the ear, were lacerated, and presented a dreadfully contused wound, the bottom of which corresponded to the temporal fossa.

By gently introducing his finger along the groove of the wound, Dr. B. withdrew some small splinters of bone, mixed with large clots of blood. He replaced the shattered bones which were still adherent, and preserved carefully the envelopes of the globe of the eye, the humours of which had been evacuated, in order to obtain a stump, movable by the muscles of the eyes, upon which a glass eye might afterwards be placed. Having pared the edges of the wound, he brought them together by stitches.

The cure went on during two months; there were no cerebral symptoms; distressing tinnitus aurium was removed by local bleedings; the suppuration was not great; the edges of the wound united perfectly, leaving a linear cicatrice; there was no exfoliation.

Case 56.—Guibon, aged 30, on the 10th December, 1830, received a wound by a case-shot, on the right inferior part of the frontal bone. The wound was contused and ragged, with splinters of bone driven in above the orbitary arch. All the splinters were removed, and a large portion of the roof of the orbit was extracted; there was a loss of cerebral substance; but no loss of feeling, motion, or intellect. The cure was well advanced by the 2d January.[67]

Case 57.—Louis Vauté was struck obliquely on the face with a cannon-ball, which took away almost the whole of the lower jaw, and three fourths of the upper. The two upper maxillary bones, the bones of the nose, the vomer, the ethmoid bone, both malar bones and zygomata were broken to pieces; the soft parts corresponding to those osseous portions destroyed; the right eye burst; the tongue cut across; the fauces, and posterior apertures of the nostrils completely exposed, as well as one of the glenoid cavities. Such was the state of the wound, that the comrades of this soldier had laid him in a corner of one of the French hospitals at Alexandria, in the belief that he was dead. Indeed, when Larrey first saw him, the pulse was scarcely to be felt, and the body cold and without the appearance of motion.

As he had taken nothing for two days, Larrey's first care was to administer to him, by means of an œsophagus tube, some soup and a little wine. His strength was re-animated; he raised himself, and testified by signs the most lively gratitude. Larrey washed the wound, removed the foreign substances which adhered to it, cut away the soft parts which were in a state of disorganization, tied several vessels which he had opened in doing so, and brought the flaps together, as much as possible, by stitches. He also united by stitches the two portions into which the tongue had been divided. He covered the whole excavation with a piece of linen with holes cut in it, and dipped in warm wine, and then applied fine charpie, compresses, and a bandage. Every three hours, a little soup and some spoonfuls of wine were given with the gum-elastic tube and funnel. The dressings were frequently renewed, on account of the flow of saliva and other fluids. Suppuration was established, the sloughs separated, the edges of the enormous wound approached each other, and the parts which were brought together adhered; 35 days after the injury, the man was in a state to be moved, and ultimately cicatrization was completed. After having been fed during the first 15 days through the tube, he was able to take nourishment with a spoon.

The patient returned to France; and 11 years afterwards, when Larrey published his work[68], was alive, and in good health, in the *Hôtel des Invalides*. He could even speak so as to make himself understood, especially when the large opening into his face was covered with a gilt silver mask.

I have thus attempted to classify and illustrate the different injuries to which the orbit is liable, and the various effects which those injuries are apt to produce. There remain only two topics, on which I wish to say a few words.

1. *Prognosis.* It is evident, from the cases which have been passed in review before us, that although, in general, immediate death is the consequence of an injury extending through the orbit to the brain,

yet this is not always the case; but that in some instances life has been prolonged for several days, and that in others the patient has completely recovered.

Putting aside the important question, whether or not large vessels have been ruptured and blood extravasated, it is probable, that it is nor so much the absolute amount of injury to the brain, as the suddenness with which it is inflicted, which renders wounds of the brain so generally fatal. We have examples of disorganization of very considerable portions of the brain proceeding slowly, and yet life prolonged for years; while in perforation of the roof of the orbit, the smallest wound of the brain may prove immediately mortal. Pathologists generally attempt to explain the sudden and fatal effects of such wounds of the brain, by telling us, that thereby the heart, or the organs of respiration, are instantly deprived of the nervous energy necessary for continuing their functions. But how it happens that death takes place instantaneously in some cases of this sort, while in others the person suffers so little from sudden and severe injury of the brain, but lingers, like Mr. Waldon's patient with the gun-breech in his head, or recovers, like Mr. Cagua's, M. Bagieu's, and Dr. Harlow's patients, we cannot tell, any more than we can explain how one man shall have a limb carried off or shattered to pieces by a cannon-ball, without exhibiting the slightest symptom of mental or corporeal agitation, while deadly paleness, violent vomiting, profuse perspiration, and universal tremor, shall seize another on the receipt of a slight flesh wound. To say that all this depends on differences in nervous susceptibility, is only to repeat the fact in other words, not to explain it.

2. *General Treatment.* In regard to the general treatment of injuries of the orbit, it is plain what that ought to be; namely, quiet and rest; a spare diet; blood-letting, if the re-action demands it; opiates; laxatives; gentle diaphoretics; a mercurial pill occasionally, if the liver becomes irregular in its action, as from confinement it is very apt to do; great cleanliness in regard to the injured parts; emollient cataplasms and soft light dressings, frequently renewed.

We must not neglect the use of blood-letting, but we must beware of employing this remedy too soon or too profusely. We must not omit to examine the injured parts frequently, in order, if there be any piece of exfoliated bone or foreign substance keeping up irritation, that it may be withdrawn, and as soon as the sloughs have separated, and the inflammation diminished, we must draw the edges of the wound together, and keep them as nearly as possible in contact with one another; but, on the other hand, we must avoid too much poking and intermeddling, or attempting prematurely to close up the issues, by which matter and foreign substances may have still to escape. In some cases, it will be necessary to divide the soft parts, or even to apply the trephine, in order to allow an exit to extravasated blood, evacuate purulent matter, or remove depressed or detached pieces of bone. All other things being equal, the cure proceeds more favourably when there is a free outlet to the fluids extravasated or secreted in consequence of the wound. A simple fissure, with effusion of blood, being followed by inflammation, is often more dangerous than a fracture, with splinters, and even loss of part of the brain.

[1] Œuvres d'Ambroise Paré; Liv. x. cap. 9; Paris, 1607.

[2] Observations on Wounds of the Head, p. 107; London, 1766.

[3] Quoted from the Journal de Médecine de Corvisart, Dec. 1808, by Ansiaux, Clinique Chirurgicale, p. 48; Liége, 1829.

[4] Nouveau Système du Cerveau, par F. P. du Petit, in Œuvres diverses de Louis; Tome ii. p. 41; Paris, 1788.

[5] Duncans' Annals of Medicine, vol. i. p. 358. Edinburgh, 1796.

[6] Musæum Nosocomii Vindobonensis, p. 45; Vindobonæ, 1816.

[7] Clinical Lecture in the Royal Infirmary of Edinburgh, March, 1828, p. 5.

[8] Philosophical Transactions for 1740; Vol. xli. Part ii. p. 495.

[9] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. ii. p. 192; Berlin, 1821.

[10] Bright's Report of Medical Cases; Vol. ii. p. 36; London, 1831.

[11] Mémoires de l'Académie Royale des Sciences, Année 1703, p. 355; Amsterdam, 1738.

[12] Chopart, Mémoire sur les Lésions de la Tête par Contre-coup, p. 1; Paris, 1771.

[13] De Renunciatione Vulnerum, p. 168; Lipsiæ, 1755.

[14] See the French translation of this work, by MM. Laugier and Richelot, p. vii. Paris, 1844.

[15] Bell's Anatomy, Vol. i. p. 49; London, 1811. The thinness of the orbitary plate, like the thinness of the middle of the os ilium, or scapula, must be regarded as the natural constitution of the bone, and not at all as the effect of pressure by the brain, or rolling of the eye.

[16] Ruyschii Observationum Centuria; Obs. 54; Amstelodami, 1691.

[17] Petri Borelli Historiarum et Observationum Centuria II, Obs. 19; Francofurti, 1676.

[18] See a similar case by Diemerbroeck, in his Anatome Corporis Humani, p. 637; Ultrajecti, 1672.

[19] Lancet, May 12, 1832, p. 190.

[20] Joannis Schmidii Miscellanea; quoted by Bonetus in his Sepulchretum, Tom. iii. p. 380; Lugduni, 1700.

[21] Medical Gazette, Vol. xxvii. p. 587; London, 1841.

[22] See a similar case in Bright's Reports of Medical Cases, Vol. ii. p. 611; London, 1831.

[23] Dublin Quarterly Journal of Medical Science; Vol. xii. p. 226; Dublin, 1851.

[24] Journal de Médecine, Tome iii. p. 530; quoted in Dictionnaire des Sciences Médicales, Tome xxxvii. p. 558. See a case by Hewett, of a child, in whom the orbit was penetrated by a lead-pencil; Medical Gazette; Vol. xli. p. 553; London, 1848.

[25] Traité Théorique et Pratique des Blessures par Armes de Guerre, rédigé d'après les Leçons Cliniques de Dupuytren, par Paillard et Marx, Tome ii. p. 216; Paris, 1834.

[26] Medical Times, March 22, 1851, p. 316.

[27] Philosophical Transactions for 1763; Vol. liii. p. 234.

[28] Ibid. for 1748; Vol. xlv. p. 520.

[29] Albucasis Methodus Medendi; Lib. ii. cap. xciv. p. 166; Basileæ, 1541.

[30] Paré, Apologie et Voyages; Voyage de Boulogne, 1545.

[31] Manuel du Chirurgien-d'Armée. p. 111; Paris, 1792.

[32] Médecine Opératoire, Tome i. p. 409; Paris, 1822.

[33] Fischer, Klinischer Unterricht in der Augenheilkunde, p. 32; Prag. 1832.

[34] Demours, Traité des Maladies des Yeux, Tome ii. p. 45; Paris, 1818.

[35] Bell's System of Surgery; Vol. iv. p. 162; Edinburgh, 1801.

[36] See Quesnay sur les Plaies du Cerveau, Mémoires de l'Académie Royale de Chirurgie, Tome ii. p. 131, 12mo; Paris, 1780.

[37] Quarterly Journal of Medical Science, Vol. xi. p. 352; Dublin, 1851. At p. 354 of the same volume, a case is given of a piece of tobacco-pipe passing through the orbit into the brain, and detected only on dissection.

[38] Petri de Marchettis Observationum Sylloge; Obs. 23; Londini, 1729.

[39] Cases in Surgery, by Charles White, p. 131; London, 1770.

[40] Gregorii Horstii Observationum Lib. i.; Operum Tom. ii. p. 226; Norimbergæ, 1660.

[41] Op. cit. Obs. 17; Londini, 1729.

[42] O'Halloran on Injuries of the Head, Transactions of the Royal Irish Academy; Vol. iv. p. 157.

[43] Mémoires de la Société Médicale d'Emulation; Vol. vii. p. 86; Paris, 1811.

[44] Hennen's Observations on some important points in Military Surgery, p. 370; Edinburgh, 1818.

[45] Baudens, Clinique des Plaies d'Armes à feu; p. 162; Paris, 1836.

[46] Ibid. p. 163.

[47] Memoires de l'Académie Royale de Chirurgie; Tome vi. p. 202, 12mo; Paris, 1787.

[48] Thomson's Report of Observations in the Military Hospitals, after the Battle of Waterloo; p. 64; Edinburgh, 1816.

[49] De Affectibus Capitis Internis et Externis; Obs. 11. p. 27; Scaphusii, 1727.

[50] Quoted from the Journal Générale de Médécine, Tome xxxv. p. 387; by Briot, in his Histoire de la Chirurgie Militaire en France, p. 111; Paris, 1817.

[51] Medical, Chirurgical, and Anatomical Cases and Observations, translated by Wirgman; Obs. lxxiv. p. 92; London, 1755.

[52] Op. cit. p. 65.

[53] Memoirs of the Literary and Philosophical Society of Manchester, vol. iv. p. 23; Manchester, 1793.

[54] Op. cit. p. 127.

[55] Op. cit. p. 361.

[56] Philosophical Transactions, abridged by Jones, vol. v. p. 203.

[57] Quoted from Bresciani De Borsa, in the Medico-Chirurgical Review for April, 1846, p. 358.

[58] Garengeot, Traité des Opérations de Chirurgie; Tome iii.; Obs. xx. p. 155; Paris, 1731.

[59] Op. cit. p. 361.

[60] Memoirs of the Medical Society of London; Vol. v. p. 409; London, 1799.

[61] Medico-Chirurgical Transactions; Vol. xiii. p. 283; London, 1827.

[62] Op. cit. Obs. 15. p. 33.

[63] Mémoires de l'Académie Royale de Chirurgie; Tome i. Partie ii. p. 127. 12mo; Paris, 1780.

[64] Clinique Chirurgicale, par N. Ansiaux; p. 276; Liége, 1829.

[65] American Journal of the Medical Sciences; New Series; Vol. xx. p. 13; Philadelphia, 1850.

[66] Op. cit. p. 151.

[67] Paillard, Relation Chirurgicale du Siége de la Citadelle d'Anvers, p. 145; Paris, 1833.

[68] Larrey, Mémoires de Chirurgie Militaire; Tome ii. p. 140; Paris, 1812. Vauté survived his wounds 18 years, and died a violent death in the hospital at Charenton. A sketch of his appearance during life is given in the Dictionnaire des Sciences Médicales, Tome xxix. Pl. 2; and a figure representing his cranium on dissection, in the Journal Complémentaire du Dictionnaire, Tome viii. p. 119.

SECTION II. — PERIOSTITIS, OSTITIS, CARIES, AND NECROSIS OF THE ORBIT.[1]

We have hitherto considered the orbit, merely as a part exposed to a variety of external injuries. We must now turn our attention to it as a part subject to inflammation and its consequences.

The bones are susceptible of the same diseases as the soft parts; they inflame, and when inflamed they redden, swell, become painful, and are the seat of effusions; in different stages of disease, or in different circumstances, they harden or soften; they suppurate, ulcerate, mortify, and slough. On account of the mineral matter which they contain in the proportion of about 2 to 1 of animal matter, although abundantly supplied with blood-vessels, the whole of the processes, whether natural or morbid, which go on in the bones, take place with less rapidity than do similar changes in the soft parts. Inflammation in particular, ulceration, and mortification, with all their concomitant phenomena, proceed in general very slowly in bones. We meet, indeed, with both acute and chronic inflammation of the bones; but the chronic is much the more frequent. The periosteum, with which they are everywhere closely invested, possesses a much greater degree of vitality than the bones themselves; and as this membrane is not merely adherent to their surfaces, but sends innumerable vessels into the continuous network of canals and cancelli hollowed out in their substance, we find the bones very apt to suffer when the periosteum is diseased. The periosteum, however, may separate from a bone, without the bone perishing; and a bone may inflame and become carious, while the periosteum adheres to it. All inflammatory changes, and all malignant and non-malignant growths in bone, have their site in the Haversian canals.

The dura mater, making its exit by the numerous foramina of the cranium, is continued into the periosteum. The envelope which the optic nerve derives from the dura mater, having reached the point of origin of the recti muscles of the eye, splits into two laminæ, the exterior of which is lost in the periorbita, while the interior, which is whiter, denser, and thicker, forms a tubular sheath for the nerve, exterior to its neurilema, and becomes continuous with the sclerotica. Between these two laminæ, a canal is formed for the transmission of the ophthalmic artery. It is not by the optic foramen alone, however, that the dura mater enters the orbit. The dura mater closes in part the spheno-orbital fissure, and sends into the orbit by this opening a prolongation, which is also continued into the periosteum of the orbit. Through this prolongation, the 3d and 4th nerves, the 1st division of the 5th, and the 6th, enter the orbit, and the ophthalmic veins escape from it. At the base of the orbit, the periorbita, joining the periosteum of the face, is continued into the palpebral fascia or fibrous layer of the eyelids. The bones of the orbit derive nourishment not from the periorbita alone; the roof is supported, on its upper surface, by the dura mater; the floor, on its lower surface, and the inner wall, on its mesial surface, by the mucous membrane of the nasal cavities; and the outer wall, on its outer surface, by the periosteum of the temporal fossa.

Causes. Inflammation of the periosteum and bones of the orbit may result from different causes; for example: 1st, Injuries, perhaps producing fracture; 2nd, Cold, and other common causes of inflammation; 3d, Syphilis, scrofula, or other diseases of a constitutional nature, acting locally; and 4th, The spread of inflammation from the neighbouring parts, and especially from the soft parts contained within the orbit. We should call the first three examples *primary*, and the last *secondary* inflammation of the orbit.

Inflammation of the periosteum or of the bones of the orbit, primarily or secondarily excited, may terminate by resolution. If the periosteum is left in a thickened state, the term *node* or *periostosis* is applied to the swelling. If an increased deposition of osseous matter is left in the inflamed bone, or on its surfaces, *hyperostosis* or *bony node* is the term used. Periostitis or ostitis may terminate in the formation of pus, and this may be deposited either between the periosteum and the bone, or in the cancelli. When the disease proceeds to ulcerative absorption of the bony substance, it is styled *caries;* if it ends in the death of the inflamed piece of bone, *necrosis*.

Arising from causes of the first or second set above enumerated, periostitis or ostitis of the orbit is more apt to run an acute course, and to be attended with severe pain, fever, and immediate danger, than when causes of the third or fourth class are in operation. When acute, pus is likely to be deposited between the periorbita and the bones; the eyeball to be displaced, if the disease is completely within the orbit; and sympathetic inflammation to be excited in the membranes of the brain, terminating fatally. Chronic cases, again, are more likely to end in thickening of the periosteum, or destruction of the bones.

I do not consider it necessary to describe further than I have done, the inflammatory effects of those injuries of the orbit, which form the subject of the preceding section. In penetrating wounds especially, and in gunshot wounds of the orbit, we must lay our account with inflammation of the bones and periosteum, followed by suppurations, sloughings, sinuses, caries, necrosis, and tedious exfoliations.

Demours speaks[2] of *primary* inflammation of the orbital periosteum as extremely common; but the symptom to which he refers, is evidently nothing more than the circumorbital neuralgia, which, increasing every evening, and relaxing every morning, is an attendant on some of the internal ophthalmiæ. It seems more reasonable to refer the pain, in such cases, to the branches of the 5th nerve, radiating from the orbit, than to the periosteum.

The most frequent cause of *secondary* inflammation of the bones of the orbit, is supposed to be inflammation of the orbital cellular substance, or of the lacrymal gland, going on to suppuration, and the abscess, either from misapprehension or neglect, not being opened; while, in some cases, severe inflammation of the eyeball spreads, not only to the surrounding soft parts, but also to the periosteum and the bones. Orbital tumours, running into suppuration, sometimes produce similar effects.

Inflammatory affections of the bones of the orbit occur in various situations, and in different degrees of extent. Its exterior margin, just within its cavity, the fossa lacrymalis, the middle part of one or of several of its parietes, and the apex of the orbit, where it communicates with the cranium, are the several situations where the bones have been met with in a diseased state.

§ 1. *Acute Periorbitis.*

The symptoms in acute inflammation of the periosteum and bones of the orbit, may be gathered in some measure from a case presently to be quoted. A case of a lady, related by Dr. Abercrombie[3], in whom a swelling of the upper eyelid being punctured, purulent matter was discharged, and on a probe being introduced deep into the orbit, the bone was felt bare, bears also in some respects on our present subject. The pain in the left temple, with which the patient was suddenly seized at the commencement of her illness, appears attributable to inflammation of the periosteum lining the roof of the orbit, and it may even be doubted, how far the fatal inflammation of the dura mater and tunica arachnoidea on the right side, was not a sympathetic effect arising from the previous disease of the left orbit.

Case 58.—A boy, aged 15, had a swelling of the right cheek, and pain of the teeth. After some days, the pain removed to the left side of the head, where it occupied entirely the eye and its dependencies. He then had irregular attacks of fever, with want of sleep and loss of appetite, and about the 7th day considerable delirium. On the 8th day the eyelid was swollen, so as to close the eye; and on raising it, the eyeball appeared unusually prominent. He had nausea, and severe headache, but was quite sensible, and the fever was moderate; some delirium occurred towards night, and the swelling extended beyond the eyelids over the forehead. On the 9th day there was permanent delirium; on the 10th, coma and death.

The left eyelid, and the integuments of the left side of the forehead, were imbued with purulent matter; the frontal bone was denuded and carious for a considerable space; the abscess penetrated the orbit, and pus was found in its upper and back part, where the bone was also denuded. The caries of the frontal bone occupied its whole thickness, and extended in length somewhat beyond the roots of the hairs, and transversely from the external orbitar process beyond the nose.

The dura mater was detached and covered with pus over a space corresponding with the external disease, but it was not detached from the superior part of the vault of the orbit. The arachnoid was covered with purulent matter; there was very little fluid in the ventricles, and the brain in other respects was healthy.[4]

In acute periorbitis, however limited the inflammatory affection may be, it is evident that very active antiphlogistic measures will be required. The division, also, of the inflamed periosteum with the knife, as soon as the symptoms are sufficiently indicative of the nature and seat of the affection, should be attempted.

§ 2. *Chronic Periorbitis.*

Chronic periorbitis of the orbit is generally the result of syphilis, or of the inordinate use of mercury for the cure of syphilis. Our knowledge of the symptoms we owe chiefly to Mr. Hamilton of Dublin.[5]

1. The eyelids are swollen and of a pale red colour, or œdematous.

2. The eyeball is protruded from the orbit, and most frequently depressed; the conjunctiva affected with pale chemosis; the patient sees double, the one image appearing above the other; there is confusion of sight, the motions of the eye are impeded, and ptosis sometimes takes place.

3. There is pain in the orbit, and pain above the eyebrow, extending in some cases over the whole head, and aggravated at night. One of the most diagnostic signs is a shrinking tenderness, if the edge or walls of the orbit be pressed upon, or even the forehead or temple. The pressure must be directed perpendicularly towards the bone; upwards, for example, if the roof of the orbit is affected. The pain is always excited when pressure is employed; and is not sometimes present, sometimes absent, in the course of the day or night, like the pain felt on pressing the supra-orbitary nerve in neuralgia.

4. In some cases, there is little apparent swelling of the periosteum; in others, a swelling is distinctly perceived within the margin of the orbit, and is even felt to fluctuate. It may be so great as to prevent the upper eyelid from being pressed up, so as to expose the eyeball. An abscess may form in connection with the diseased membrane, and may burst through the skin.

5. The disease, going on, involves the bone, causing caries of the walls of the orbit. If the roof is affected, the frontal sinus may be penetrated, or even the cavity of the cranium. In the former case, matter drains down the nostrils; in the latter, the dura mater inflames, palsy of one side of the body has been known to happen, coma is likely to supervene, and the case will terminate fatally.

6. By far the most common situation of the disease is the two inner thirds of the orbital plate of the frontal, where the bone is least protected by soft parts.

7. Simple thickening of the periorbita, effusion of thin fluid between it and the bone, and deposit of pus in the same situation, or even of cartilage or bone, are the circumstances which afford an explanation of the symptoms.

Treatment. This consists: 1. In the internal and external use of mercury. As the mouth becomes sore, the symptoms subside with remarkable rapidity. Corrosive sublimate has been especially recommended for internal use; and friction with mercurial ointment round the orbit. 2. The iodide of potassium, and other preparations of iodine, are extremely beneficial. They are often used with sarsaparilla, or with mercury. 3. Should the symptoms not yield to these remedies, and should fluctuation be obscurely perceived in the swelling, an exploratory puncture may be made, followed up, if any fluid escapes, by a larger opening with the lancet.

§ 3. *Caries and Necrosis of the Orbit.*

Whatever part of the cavity is affected, and from whatever cause the disease originates, we generally find, in caries or necrosis of the orbit, the eyelids more or less red and swollen, hot and painful, and often exceedingly œdematous. At length, a particular spot of the upper or lower lid points, and bursts, the opening generally continuing for a long time to discharge thin purulent matter; round the opening the skin is depressed, and sometimes extensively ulcerated, but more frequently the aperture becomes fistulous, and occasionally it is surrounded by fungous granulations. The probe, passed along the fistulous opening, comes into contact with bare rough bone, in the state of caries or of necrosis; exfoliation sometimes takes place; and at last, after a course of months or years, the parts heal, the external aperture closes, and in doing so, the integuments adhere to the periosteum, leaving a deeply depressed cicatrice, with more or less shortening of the lid, a symptom termed *lagophthalmos*, and with more or less *ectropium* or eversion of the lid. There are thus four stages in the course of such an affection of the orbit; first, the stage of pure inflammation; secondly, that of abscess; thirdly, that of fistula, and, fourthly, that of distortion of the eyelids.

1. *Caries of external margin of the orbit.* Chronic inflammation of the bones of the orbit occurs more frequently at the outer-inferior angle of that cavity, than at any other part of its extent. The occasion of the disease is commonly found to have been a fall, or blow; and the patients are generally children, who have suffered, or are still suffering from scrofulous affections of other bones, or of other organs. Over the malar portion of the edge of the orbit, generally with pain and external redness, but occasionally without either, a swelling makes its appearance, and by and by is felt to fluctuate. One or both lids generally become at the same time œdematous, the conjunctiva reddens, the eye is intolerant of light, and the patient is more or less feverish. The swelling becomes dark-red, and more and more prominent; it points through the skin, breaks, and discharges thin matter. The opening thus formed is close to the edge of the orbit. The swelling falls, but does not go entirely away. The external redness continues, with scrofulo-catarrhal inflammation of the conjunctiva. The matter discharged from the opening is generally thin, but sometimes thick and curdy, and occasions excoriation of the neighbouring skin. The edge around the opening becomes inverted, and adherent to the periosteum. On introducing a probe, the periosteum feels as if swollen and loosened from its natural attachment to the bone, and in general the bone is bare and rough. The œdema falls, and the conjunctivitis subsides, except that a few vessels continue to run to-

wards the cornea, which is often nebulous. By the sinking of the skin, the lid is dragged towards the sinus, is much everted (*Fig.* 1.), and ultimately adheres to the periosteum. The longer the discharge continues, with caries probably and small exfoliations, so much the more intimate are the adhesions. On dissecting a scrofulous child, in whom an adhesion existed between the lower lid and the edge of the orbit, in consequence of caries of the latter, Dr. Ammon[6] found so intimate a union of the bone, periosteum, and thinned but indurated lid, that it was impossible to separate these several parts; they formed a firm, cartilaginous-like, fibrous mass.

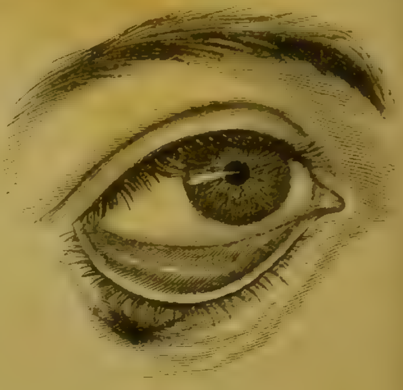


Fig. 1.

Caries of the malar bone occurs also in the adult, but follows a more tedious course, sometimes ending fatally.[7]

2. *Caries just within the cavity of the orbit.* I have met with several cases, in which a fluctuating swelling having risen just under the eyebrow, generally about its middle, and having given way and discharged matter, a fistulous opening continued for a length of time, leading to a rough and bare portion of the roof of the orbit. Almost all the subjects of this chronic affection were old people, unable to assign any cause for the inflammation, which, at first, wore the aspect of an attack of erysipelas. In one old man, a patient at the Glasgow Eye Infirmary, first the one orbit, and after it healed up, the other also became affected. In one individual, considerable shortening of the lid was produced, so much so that the eye being imperfectly covered, it inflamed, and an abscess formed in the cornea. I am unable to say what was the ultimate result in this case; but there was reason to fear that the cornea would give way, and the eye become staphylomatous. In the greater number of cases of this sort (*Fig.* 2.) which I have seen, the fistulous opening has ultimately closed, without leaving any considerable lagophthalmos.

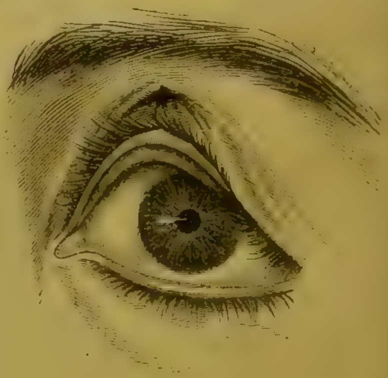


Fig. 2.

3. *Secondary caries of the fossa lacrymalis.* A suppuration within the orbit, close to the external angular process of the frontal bone, followed by a fistulous opening leading to the fossa lacrymalis, and ultimately attended with a great degree of ectropium and lagophthalmos (*Fig.* 3.) occurs not unfrequently in scrofulous children, and is generally regarded as the result of inflamma-

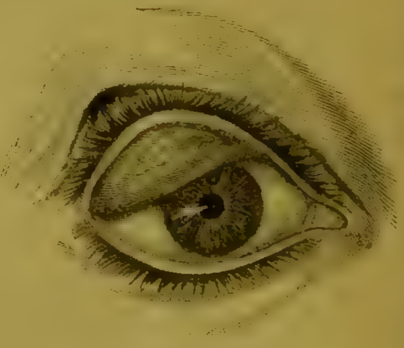


Fig. 3.

tion of the lacrymal gland. The inflammation is supposed to spread from the gland to the periosteum, which separating from its natural connections, or secreting pus on its internal surface, the bone takes on inflammation, falls into a state of ulceration, or perishes to a certain extent by necrosis.

4. *Deep-seated secondary caries of the orbit.* Inflammation of the orbital cellular substance, going on to suppuration, may take place, more or less deeply, within the cavity of the orbit; between the orbitary plate of the frontal bone, and the levator palpebræ superioris; or below the eyeball, between the rectus inferior oculi, and the floor of the orbit. Inflammation and suppuration in these situations are attended with pain and fever, immobility and distortion of the eyeball, and much swelling of the eyelids. If the disease be understood from the first, and treated on an active antiphlogistic plan, suppuration may probably be prevented; if matter has actually formed, any very serious or extensive injury may still be obviated by opening the abscess sufficiently early; but neglected or misunderstood, an abscess, even when not very deeply seated, but perhaps pointing and fluctuating through one or other eyelid, may spread its mischief to the periosteum and bones, or insinuate itself into some of the neighbouring cavities; into the nostril by the lacrymal passage, into the zygomatic fossa by the spheno-maxillary fissure, into the maxillary sinus through the floor of the orbit, into the frontal sinus, or even into the cavity of the cranium, through the orbitary plate of the frontal bone. The matter will penetrate through the bones in the last three cases, by the process technically called *progressive absorption;* a process by which the bones pressed upon are thinned and partially removed, but are seldom left in the state either of caries or necrosis. It is where there is no perforation from the orbit into the neighbouring cavities, but merely an extension of inflammation to the periosteum and bones, that caries or necrosis is most apt to take place.

Of a still more dangerous character is inflammation in the back part of the orbit, or in the cellular membrane immediately surrounding the optic nerve. Vision is always injured, and often destroyed, by suppuration in these situations; the eyeball is pushed forward from its natural place; not unfrequently *exophthalmia* follows close upon this state of *exophthalmos;* that is to say, the eyeball is affected with inflammatory disorganisation as well as protruded; nay, I have known deep-seated abscess of the orbit to prove fatal, the patient having for a day or two shown symptoms of pressure on the brain, and in fact dying apoplectic. I need scarcely say that, in such cases, the periosteum and bones of the orbit will be very apt to suffer, especially if the disease is prolonged, and no attempt made to evacuate the abscess which may have formed.

It occasionally happens that several different portions of the orbit are affected at the same time, ending in the formation of a number of sinuses, passing through the eyelids in the direction of the diseased pieces of bone, and sometimes opening in the temple. In these cases the integuments are always puffy and greatly swollen. Such a state is commonly the result of severe and general inflammation of the orbital cellular membrane, running on into suppuration. When the floor or the inner wall of the orbit is the seat of caries or necrosis excited in this way, we almost always find that the whole thickness of the bones has to a greater or less extent been destroyed, permitting the matter to drain from the orbit into the nostril or into the maxillary sinus. A case of this kind is related in a desultory and tedious manner, by Demours.

Case 59. — The patient was a canon of Besançon, in whom it would appear that suppuration had entirely destroyed the cellular membrane of the orbit, and that a part of the upper lid had been lost by gangrene. The eyeball was destroyed, the upper lid was everted and shortened, and there were four fistulous openings into the orbit, two at the upper edge, and two at the inner canthus. Fetid matter, mixed with curdlike substance, was discharged, some pieces of bone came away, and injections passed for a time from the orbit into the maxillary sinus and nostrils; at last the discharge ceased, the parts became quiet, the sinuses closed, and a glass eye was applied to cover as much as possible the deformity. The general health does not appear to have been affected. The chief local treatment consisted in mild injections, frequently repeated in the course of the day.

Although caries of the orbit is generally attended by abscess of the soft parts in its neighbourhood, (if it has not itself originated in such abscess,) the skin of one or other eyelid inflaming, and at length giving way, and an external fistula forming, yet cases may occur in which the disease shall be situated very deep in the orbit, in the sphenoid bone, for example, where it gives passage to the optic, or other orbital nerves, so that amaurosis may be brought on, any suppuration of the soft parts lie long concealed, or even death ensue, before any external marks of the disease be present.

5. *Syphilitic caries of the orbit.* When the bones of the orbit inflame from syphilis, after pain in the neighbourhood of the diseased part, not in general acute, there appears a swelling of the eyelid, slightly red at first, and but little painful to the touch, but which slowly advances in redness, pain, and prominence, till it is felt to fluctuate, and either bursts of itself, or is opened with the lancet. It is but rarely that an opportunity is afforded of watching the invasion and progress of such a case. Much more frequently the patient applies for aid, only after the abscess has burst and discharged matter for a length of time.

It is evidently impossible to decide, from a mere examination of the diseased bone, what has been the nature of the inflammation in which the caries or necrosis has originated, whether syphilitic, or scrofulous, or of what other kind. We must refer to the history of the case and the constitutional symptoms, in order to determine, if possible, this point.

In syphilitic cases, we might be led to expect considerable pain, aggravated during the night. Other bones, besides those of the orbit, are likely in such cases to be affected with similar disease. The bones of the nose, and the frontal bone where it forms the forehead, are much more apt to be affected with syphilitic inflammation, than are the walls of the orbit. In a case which I saw, both orbits were affected, and it appeared that the patient had had a similar disease of the right acromion, a painful node on the left side of the forehead, and repeated chancres and buboes, during the eighteen months preceding the disease of the orbits. Such a history naturally led to the conclusion that the disease of the orbits was syphilitic.[9]

Prognosis. It is evident that both the prognosis and the treatment will be different in different cases. In a healthy adult, in whom the affection of the bones is the result of an injury, the prognosis will be much more favourable, and the treatment more simple, than in a scrofulous child, or an individual whose constitution is imbued with syphilis, or impaired by frequent courses of mercury.

In respect to the prognosis, I may mention that the eye is in danger of being destroyed in caries of the orbit, simply in consequence of the lagophthalmos, or incapability of closing the eye. In almost every case of caries of the orbit which I have seen, there was either eversion, or lagophthalmos, or both; and in consequence of the eyeball being but partially covered when the patients attempted to shut the eyes, there was always inflammation of the conjunctiva, sometimes inflammation and nebula of the cornea. In an instance to which I have already referred, in which the lagophthalmos was to a great extent, the upper eyelid being permanently drawn upwards and backwards into the orbit, so that a very considerable portion of the eyeball was continually exposed to the contact of the air and of foreign particles floating through it, there were pustule of the cornea and onyx. I was consulted only once in this case, but I have no doubt that the cornea would soon after be so much affected as to give way, and the eye be ultimately left staphylomatous or atrophic. The caries affected the roof of the orbit immediately behind the middle of the supra-orbitary arch.

When caries of the orbit proceeds unchecked for years, especially in scrofulous or syphilitic cases, one or other eyelid may be completely destroyed, with the exception perhaps of its ciliary edge. In this case, large folds of inflamed conjunctiva are permanently protruded.

Treatment. The treatment will vary according to the different stages of the disease. In the *first* or purely inflammatory stage, it should be solely antiphlogistic, our object being to prevent suppuration. In the *second* stage, namely, that of abscess, we must endeavour to procure absorption of the matter, or give it vent externally. In the *third* stage, namely, that of fistula, our object is to arrest the ulcerative process going on in the bone, and to promote exfoliation of any part of it which may be in the state of necrosis. In the *fourth* stage, or that of distortion, the ends we have in view are to bring the lid into a natural position, and to obviate the bad effects arising from the expossed state of the eyeball.

The treatment in the first and second stages is so obvious, that I need not enter into a detail of particulars. The remarks which follow, refer chiefly to the treatment to be followed in the third and fourth stages.

It is evident, then, that, in the *first* or inflammatory stage, leeches should be applied liberally around the orbit. I am the more disposed to advise this in all cases of contusion of the edge of the orbit, from having met with cases of this kind which, having been thought of too lightly, and therefore not treated with leeches, ran the course already described; but which, it is probable, might have been prevented from doing so, had proper antiphlogistic means been employed.

Some advantage may be obtained by the use of counter-irritation. In some cases, mercury cautiously exhibited, will do good; in a greater number, iodide of potassium.

Antiphlogistic and sorbefacient means failing to prevent or to dissipate suppuration, the abscess which has formed in the *second* stage is to be opened through the conjunctiva, if possible; but if this cannot be accomplished, then through the skin, only as far from the edge of the eyelid as can be conveniently done, in order to avoid the eversion which is apt to follow.

Case 60. — A scrofulous child, six years old, received a blow on the external-inferior part of the orbit; but suffered nothing afterwards from it for several months. When Dr. Cunier saw it for the first time, he found at the external angle of the eye, a fluctuating swelling, which he opened through the conjunctiva. An abundant quantity of pus, mixed with blood, escaped. On passing a probe, he found that a portion of the edge of the orbit was loose. Next day, he succeeded in laying hold of it with forceps, and detaching it. It measured 4 lines long, by 2 broad, and was completely necrosed. In seven days, the wound of the conjunctiva healed. Alterative doses of calomel, followed by cod-liver oil, and baths impregnated with iodine, were used; and the patient perfectly recovered. The depression at the external angle, at first considerable, became effaced, so as to leave only a slight degree of deformity.[10]

It may sometimes happen, in cases of abscess over the edge of the orbit, that the bone is merely denuded, in which case an early and pretty free incision is likely to prevent the bone from suffering in the way it would certainly do by delay. Opening scrofulous abscesses in this situation by caustic potass, rather than the knife, has been recommended.

In the *third* stage, our object is, if the disease be caries, to arrest the ulcerative process going on in the bone; if necrosis, to promote the separation and expulsion of the portion which is dead.

It will rarely be possible to decide, at first sight, whether the bone which is felt bare with the probe, is carious or necrosed, or whether both caries and necrosis are present. The exact condition of the diseased bone will become evident only in the course of the cure, from the sensations communicated through the medium of the probe, the fetor emitted, the appearances of the discharge, and the texture and size of the pieces of bone which come away.

We shall seldom be able to assist in arresting the ulcerative process, or in promoting exfoliation, without dilating the opening communicating with the diseased bone. This may be done partly with the knife, partly with tents. The fistula may first of all be enlarged by means of a bistoury; and then kept open by a dossil of lint, dipped in oil, and pushed along until it comes into contact with the diseased bone.

In cases of children, or of adults who are afraid of the knife, we may be induced to dilate the fistula by sponge-tent, although this is in fact the more painful method of the two, so painful indeed that it sometimes cannot be borne. If there are fungous granulations round the opening of the fistula, these may first of all be destroyed with lunar caustic. A piece of sponge-tent, cut into the form of a pencil, is then to be introduced, and kept in for 10 or 12 hours. Thicker and thicker pieces of sponge-tent are then to be employed, till the opening becomes large enough to admit a dossil of lint, which is to be renewed daily.

Some surgeons rest contented with soothing applications. Others recommend various means for cauterizing the exposed bone; especially red precipitate in powder, lunar caustic, either solid or in solution, the mineral acids, and phosphoric acid. The risk of such substances producing fresh attacks of inflammation in the bone, and thus extending the disease, seems greater than any chance of benefit to be derived from their use. In general, no cure takes place, unless bone comes away. The coming away of the bone is not always evident. It sometimes separates in minute scales, sticking to the dossil of lint, or washed out by the injections which are used; while in other cases, a considerable portion is thrown off at once, is felt with the probe to be loose, and is to be extracted with a small scoop or pair of forceps. There is no stated time for the necessary exfoliation in such cases. It may take place in a month; or many months may elapse before the diseased bone is discharged. It is in cases originating from injury that the most extensive exfoliation takes place. As soon as we judge it probable that the whole diseased part has been removed, we lay aside the dossil of lint, and allow the opening to close.

I do not imagine that in cases of caries or necrosis of the bones of the orbit, there ever is any considerable formation of new bone. All that nature effects in such cases is, I believe, a healing up of the diseased part, a bony cicatrice, without any attempt to restore what has been removed by ulcerative absorption, or by exfoliation. Fortunate indeed must the case be regarded, when the former process ceases, or the latter is completed, so that the diseased bone may granulate and heal, and the external wound be allowed to close, and this without any greater deformity than a deeply sunk cicatrice.

It may sometimes happen that we are deceived in regard to the state of the bone. The fistula may even close, and yet the bone continue diseased. Granulations may fill up the sinus, without its bottom being sound. Perhaps some trifling exfoliation has taken place, without the whole diseased piece of bone having come away; and the surgeon, misled by appearances and thinking that all is right, does his best to close up the sinus. Nothing, however, is gained, if the bone is still left in a state of disease. On the contrary, we are only obliged to go over again the same process of dilatation, and to wait for renewed exfoliation. Perhaps to scrape the diseased surface, or scoop it out with a gouge, may be advisable in such a case.

The exfoliation and healing up of diseased bone is throughout an organic process, and may unquestionably be assisted by whatever remedies tend to support or improve the general health. In syphilitic cases, mercury, sarsaparilla, and other anti-venereal remedies, are to be employed. In scrofulous cases, tonics, such as sulphate of quina, along with a nourishing diet and country air, will be found of use. I have no experience of the power of asafœtida, and a variety of other internal remedies, which have gained a reputation for promoting the exfoliation and healing up of bones. If they act at all, they probably do so merely as stimulants or tonics, without any of the specific power over diseased bone which has been ascribed to them. In many cases, iodide of potassium, and cod-liver oil, will be found advantageous.

Unless when the separation of the diseased portion of bone and the healing up of the sinus have been more than commonly prompt, it is rarely the case, that recovery takes place without a considerable degree of distortion of the eyelids, constituting the *fourth* stage.

The *lagophthalmos* in such cases is generally relieved in part by a loosening of the retracted eyelid, effected slowly by the natural action of the orbicularis palpebrarum, Should this prove insufficient to enable the eyelids to close, the operations for eversion to be afterwards described, modified according to the circumstances of the case, might perhaps prove useful.

Case 61. — In a patient who was under my care, at the Glasgow Eye Infirmary, with caries of the roof of each orbit, and lagophthalmos of each upper eyelid, the eyelids came very gradually to close more and more upon the eyeballs, For a time, however, the lagophthalmos was to such a degree, as to leave the conjunctiva constantly exposed to the irritation of the air, and the particles of dust floating through it. The conjunctivitis and corneitis thereby excited, I treated chiefly by the application of lunar caustic solution, till the elongation of the eyelids, produced by the action of the orbicularis palpebrarum in winking, rendered the lagophthalmos gradually less and less, and served at length to permit the eyeballs to be almost completely covered. When this patient was dismissed, the sinuses had long been healed. There still remained a slight speck on one of the corneæ; and an evident deficiency was felt at the part of each orbit which had been the site of the caries. The solution of four grains of lunar caustic to the ounce of distilled water was of signal service in this case, moderating the external inflammation of the eyeballs brought on from their state of exposure, and in fact saving the eyes, till the natural apparatus of protection was in a great measure restored to the exercise of its office.

In cases of more considerable lagophthalmos, it is curious to observe the degree of accommodation effected by the lid which is free, for supplying the defective action of the lid which is fixed, so as to

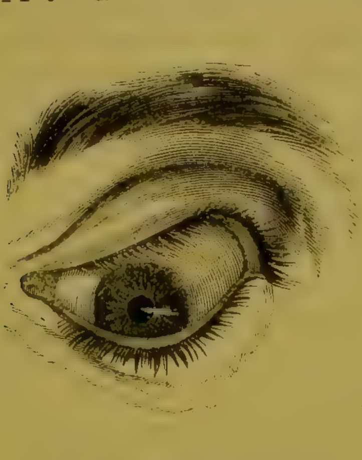


Fig. 4.—From Ammon.

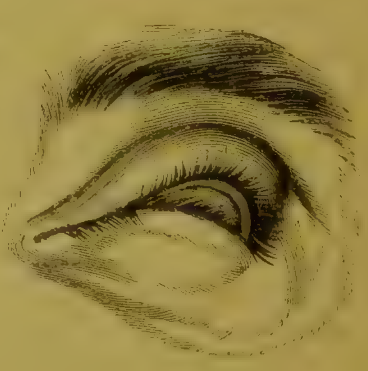


Fig. 5.—From Ammon.

lubricate the eyeball in the act of winking, and protect it from the intrusion of foreign particles. The upper lid for example, being fixed to the roof of the orbit, the appearance, when the eye is open, is such as is represented in *Fig.* 4.; when the individual winks, the upper lid not being capable of descending over the eye, the vicarious lower lid is thrust up, as in *Fig* 5. so as to meet the upper lid, and almost to cover the eye. This muscular exertion is, unfortunately, available only while the patient is awake.

I need scarcely say that it would be folly to attempt the cure of the *eversion* consequent to diseased orbit, if the fistula were still open, or the bone unsound. Were we to detach the eyelid from the edge of the orbit to which it is fixed, replace it in its natural position, and endeavour, by some operative manipulation, to make it sit close upon the eyeball, we should merely lose our labour; for the disease of the bone not being removed, the eyelid would very soon return to its former malposition. The operative means to be adopted after the bone is perfectly healed, we shall consider more fully in the third chapter, under the head of *Ectropium.*

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[1] On Diseases of Bone, consult Cumin, Edinburgh Medical and Surgical Journal; Vol. xxiii. p. 3: Stanley on Diseases of the Bones, London, 1849: Goodsir, Monthly Journal of Medical Science; Vol. x. p. 99; Edinburgh, 1850.

[2] Demours, Traité des Maladies des Yeux; Tome i. p. 91; Paris, 1818.

[3] Pathological and Practical Researches on Diseases of the Brain and Spinal Cord; p. 29; Edinburgh, 1829.

[4] Quoted by Dr. Abercrombie from new series of Journal de Médecine; Tome xi. p. 523. See Case of Periostitis of the the face, extending to Dura Mater, in a paper on Periostitis, by Sir P. Crampton; Dublin Hospital Reports; Vol. i. p. 337; Dublin, 1818.

[5] Dublin Journal of Medical Science; Vol. ix. p. 255; Dublin, 1836: Ibid. Vol. xxvii. p. 385; Dublin, 1845.

[6] Zeitschrift für die Ophthalmologie; Vol. i. p. 41; Dresden, 1830.

[7] Haynes Walton's Operative Ophthalmic Surgery, p. 229; London, 1853.

[8] Op cit.; Tome ii. p. 33. See Case by St. Yves, Nouveau Traité des Maladies des Yeux, p. 80; Paris, 1722.

[9] For cases of Syphilitic Caries of the Orbit, see Hawkins, Medical and Physical Journal; Vol. lvii. p. 318; London, 1827: Liston, Medical Gazette; Vol. v. p. 843; London, 1830.

[10] Annales d'Oculistique; Tome vii. p. 8; Bruxelles, 1842.

SECTION III.—PERIOSTOSIS, HYPEROSTOSIS, EXOSTOSIS, AND OSTEO-SARCOMA OF THE ORBIT, AND CYSTS IN ITS PARIETES.[1]

Periostosis signifies a thickening of the periosteum; *hyperostosis,* an increase of the bulk or thickness of bones; *exostosis,* a bony tumour; *osteo-sarcoma,* a degeneration of bone, generally malignant, in which it is converted into a soft mass, with numerous osseous spiculæ radiating through it. To all these diseases, the orbit is subject; as well as to the development of *cysts* in its parietes.

§ 1. *Periostosis.*

A node, or periostosis, may form on the surface of any bone; on the external surface of the skull, or within the orbit. I have seen a large venereal node occupying the upper edge of the orbit. Exostosis is often combined with greatly thickened periosteum.

A node is not unfrequently affected with secondary inflammation; it then becomes more swollen, and tender to the touch; it communicates a feeling of fluctuation, and a flow of matter is looked for on dividing it with the knife. Pus is sometimes discharged under such circumstances, while in other cases only a reddish serum escapes by the incision.

Periostosis of the orbit, except when syphilitic, and brought under the influence of mercury, or iodine, is not likely to be either readily recognised or successfully treated.[2]

An incision, down to the bone, is certain to relieve the severe pain and tension of a node; but as the consequences of this practice are generally an unhealthy tedious suppuration, perhaps also an exfoliation of bone, and certainly a very unseemly depressed cicatrice, repeated blisters over the part, and the use of mercury or iodine internally, ought first to be tried. These means are often successful in causing absorption of the effused fluid, and procuring adhesion of the periosteum and integuments to the surface of the bone, which may then present a depression in place of an elevation.

Other specific diseases, besides syphilis, may cause thickening of the periosteum of the orbit.[3]

§ 2. *Hyperostosis.*

Inflammation of a bone being arrested before the occurrence of disorganisation or death of the part, the consequence is sometimes hyperostosis. It is a variety of this process which, in some cases and these generally complicated with atrophy of the brain, slowly thickens the bones of the cranium, without perhaps exciting any suspicion of the existence of such a state, till epilepsy or mania, and ultimately death, are produced. The bones of the orbit are liable to the same process; the cavity will thereby be intruded upon, its contents pressed together, and the eyeball pushed forward from its natural place, and at last destroyed.

I have now before me the skull of an Indian child, probably about six years of age, which was picked up as it rolled down the Ganges. There has been ostitis of the roof of each orbit; but in the left one the affected bone is elevated into a hyperostosis, and the surface marked by numerous orifices of the Haversian canals greatly expanded.

I have also before me an adult male Indian skull, thickened and altered from ostitis. Although a small skull, it weighs, without the lower jaw, 1 pound 15½ ounces. The bony palate has been in a considerable measure destroyed by caries. The left parietal bone, and the margins of both orbits, are thickened and covered with osseous protuberances, the fibres of which present in several places a stellated arrangement.

In some cases, the whole bones of the head are affected with hypertrophy. There may be a combination of hyperostosis with exostosis; as in the case presently to be quoted from Jourdain.

The only treatment likely to be useful in hyperostosis is the employment of alteratives.

Case 62. — Hyperostosis of the facial bones shutting up the orbits. Jourdain has related and figured a remarkable case of hyperostosis of the bones of the skull, and especially of those of the face. The patient was the son of a surgeon at Perpignan. At the age of 12 years, he was affected with a lacrymal tumour at the inner angle of the right eye, which his father opened, and which suppurated for a pretty long time. When the tumour was opened, an eminence was observed growing from the middle of the nasal process of the upper maxillary bone, about the size of a small almond. It resisted different local applications, and grew, so that in a short time it was a considerable tumour. By the time that the patient was 15, his two upper maxillary bones were equal, and presented two eminences so considerable, that they served to bury between them the cartilages of the nose, and so compressed the nostrils, that the patient could breathe only by the mouth. His school-fellows could not endure the deformity of his face; yet they loved him for his wit and talents. Every thing was done by his father which was likely to remove the disease; but all was ineffectual. At the age of 20, his appearance was monstrous, so that his friends dissuaded him from thinking of the priesthood, to which he had intended to attach himself. His lower jaw was also affected with an enlargement, which augmented more and more. Although his appearance was such as to oblige those who met him to turn away from looking at him, he was very inquisitive, and would visit every thing which excited attention. He ate and drank well, till, having reached his 44th year, he was attacked with fever, during his convalescence from which he became blind. As he recovered strength he began to see with his left eye, and go about alone; but inflammation of the chest supervening, with suppuration, and bloody expectoration, he died.

On dissection, the left lung was found almost destroyed by suppuration. With the greatest attention, it was impossible to discover any of the muscles of the face. The skin was glued to the periosteum. The cranium and face were entirely exostosed. The malar and superior maxillary bones especially appear, from Jourdain's figure, to have given rise to a large exostosis on each side projecting so as to meet each other, and covering the nose, and in a great measure the orbits. The lower jaw also is exceedingly enlarged. The exostoses were as hard as marble. The cranium and face weighed 5 French pounds; the lower jaw by itself weighed 3 pounds 3 ounces; the whole together, 8 pounds 3 ounces; whereas, an ordinary adult skull, including the lower jaw, weighs generally about 1 pound 9 ounces, or at most 1 pound and 3 quarters; so that taking the pound at 16 ounces, the exostoses had augmented the weight of the head 6 pounds 7 ounces. This patient had never complained of pain in his head nor in his lower jaw.[4]

§ 3. *Exostosis.*

This is a circumscribed tumour, consisting of newly formed osseous matter. Tumours, presumed to be exostoses in an incipient state, have been met with within the orbit, wholly in a cartilaginous state; in other cases, the tumour has been partly cartilaginous, partly osseous. The cartilaginous deposition is supposed gradually to undergo the change which converts it into bone. It is by no means, however, a necessary step in the process by which an exostosis is formed, that there shall be a preliminary deposition of cartilage. Three varieties of exostosis have been distinguished; the *cellular*, the *craggy*, and the *ivory;* the first presenting an external crust, within which are numerous bony partitions, together with a quantity of soft substance, and occasionally hydatids; the second consisting of a mixture of osseous laminæ with cartilage, but without any shell; the third, white and dense throughout, like ivory. In the last, and partly in the first, the deposit consists of pretty perfect bone; but in the craggy exostosis, the matter deposited is a sort of false bone, not perfectly organized. The *cellular* exostosis appears to be one of the diseases comprehended under the old name *spina ventosa.* It proceeds from the periosteum, is not preceded by cartilage, seldom acquires a very large size, and often ceases to grow. Several such exostoses occur not unfrequently in the same individual. The *craggy* is not so common. It may grow either from the cancelli or from the periosteum. The tumour has a cartilaginous covering, the periosteum being imperfectly traceable over it, and into its substance. The centre of the tumour is generally bone; sometimes cartilage. The *ivory* is exceedingly dense, and of high specific gravity. In composition, it does not differ much from ordinary bone. It originates in the diploe, pressing the compact tissues of the bone before it, and forms a round smooth tumour. It is the most frequent exostosis affecting the orbit, tending at the same time to intrude on the cavity of the cranium.

Symptoms. Exostosis springs in some cases from the edge of the orbit; its nature is recognised by the touch; and as it grows, it comes in part to cover and confine the eye. Although, in general, the touch will serve to discriminate between exostosis in this situation, and any other kind of growth, I may mention that I have seen a case of scirrhous tumour attached to the edge of the orbit, and partly within its cavity, so very firm in its consistence, and unyielding in its attachment, as to have been taken for an exostosis, previously to dividing the skin for its extirpation.

Exostosis from the edge of the orbit is sometimes combined with encysted tumour, of which I had an instance at the Glasgow Eye Infirmary, in a middle-aged female. The encysted tumour had existed from infancy, and was attended with exostosis from the edge of the frontal bone, preventing the patient from raising the upper lid. After a gentle mercurial course, the exostosis diminished so much as to permit the lid freely to exercise its functions. The case was probably in part syphilitic, as the patient afterwards presented herself with a suspicious-looking sore on the arm, which healed under the use of mercury.

Exostosis may spring from any side of the orbit. We might perhaps suppose it more likely to grow from the floor or from the temporal wall of that cavity, than from the thin bones which form its roof and nasal side; but this does not appear to be the case. The surface throwing out an exostosis is generally thickened. The most remarkable symptoms produced by an exostosis within the orbit are the following: —

1. *Exophthalmos.* This is one of the earliest symptoms of any kind of growth within the orbit. Sometimes the eye is projected directly forwards, even when the osseous tumour is afterwards found to arise not from the apex of the orbit, but from one or other of its sides. More frequently the eyeball is pushed forwards and to one side, towards the nose or temple, upwards or downwards, according to the side of the orbit giving rise to the exostosis. If the case is left to itself, the protruded eye sometimes inflames and bursts.

2. *Pain.* This is very variable; nor is it easy to explain how some suffer so severely, even from a small exostosis within the orbit, while others from large tumours of this sort suffer but little. The pain is communicated through the fifth nerve, and is sometimes felt in the eyeball, sometimes deep in the orbit, sometimes in the temple.

3. *Amaurosis.* The protrusion of the eye must be attended with dragging of the optic nerve; and this, along with the pressure caused by the tumour, generally induces dimness of sight, and at length blindness. Amaurosis is sometimes the earliest symptom. It is wonderful, however, to observe how much an eye is in some cases protruded and displaced by an exostosis, and yet vision retained.

4. *Change of form.* Exostosis often increases to such a size as considerably to disfigure and intrude upon the orbit. It advances so as to be felt between the edge of the orbit and the eyeball, or even form a considerable protuberance beyond the basis of the orbit. It may fill so much of the orbit, that the eyeball is no longer contained in this cavity. It may intrude upon the nostrils, upon the opposite orbit, or even upon the cavity of the cranium, and thus prove fatal.

Diagnosis. In exostosis of the orbit, it is often impossible to decide regarding the nature of the disease, before proceeding to operate, or before the death of the patient; for exophthalmos, pain, amaurosis, and deformity of the orbit, are found to arise from several other diseased states of the parts besides an osseous growth; as, encysted and other tumours, fungus of the maxillary sinus, &c. In advanced cases of fungus of the maxillary sinus, other symptoms, no doubt, attend those already enumerated, as softening of the palate, distension of the cheek, and obstruction of the nostril, which may serve to distinguish such cases from any disease confined to the cavity of the orbit. But between an encysted orbital tumour, not yet advanced so as to press upon the eyelids, and a deep-seated exostosis, it is often totally impossible to discriminate. The eyeball is merely extremely prominent, and the patient deprived of the sight of that eye, without any tumour being felt, or any other diagnostic symptom being present. Neither can we pretend to decide in cases of this dubious kind, whether thickening merely of the periosteum, thickening of the bones, or such a tumour as we call exostosis, be the cause of the exophthalmos.

Prognosis. Cellular exostoses are said to be occasionally destroyed by suppuration and caries; any such change can scarcely be expected to take place in the craggy, and much less in the ivory exostoses. Nor will the mere possibility of any exostosis being destroyed by inflammation, ever withhold us from removing such tumour by operation; for its spontaneous destruction must be uncertain and tedious. The ivory exostosis is much slower in its progress than the others, and sometimes it entirely ceases enlarging. If the surface of the tumour feels through the integuments nodulated or botryoidal, it may be concluded that it is of ivory consistence, with a broad base, and from its excessive hardness very difficult to extirpate. If the exostosis is small, and does not seem increasing, it should not be interfered with.

Several preparations have been described showing the ultimate result of exostoses of the orbit. Thus, Dr. Baillie, in his Series of Engravings Illustrative of Morbid Anatomy, has given a figure of a preparation of exostosis of the orbit, belonging to Mr. Hunter's museum. The figure (*Fig.* 6.) shows an inner view of a section of the fore part of the cranium. The section had been made at such a level, as to include a small part of each orbit. A tumour is represented occupying the left orbit, which it has considerably dilated, and shooting for some way across into the other orbit, and backwards into the cavity of the cranium. Dr. Baillie mentions that the tumour was nodulated, and presented a compactness of texture exactly like that of ivory. Unfortunately no history of the case appears to have been preserved.[5]

A frontal bone, picked up in Lower Alsace, is described and figured by Frank, in which an exostosis fills both orbits, projects far upon the face, and occupies a large portion of the cranial cavity.[6] These two cases bear a considerable resemblance to the masses of bone, not unfrequently found within the cranium of oxen, and ignorantly taken for ossifications of the brain.

A The inner surface of the anterior part of the cranium.
B The right orbit.
C The exostosis, resembling ivory, filling the left orbit.

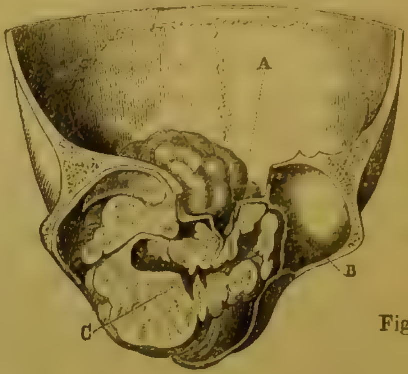

Fig. 6.

Causes. Besides venereal and scrofulous constitutional disease, contusions and fractures of the orbit have been known to give rise to exostosis. Cases of partial hypertrophy of the osseous system seem sometimes to depend on a depraved condition of the digestive organs, combined with a deficiency of saline matter in the urine.

Treatment. This must consist in attention to the state of the digestive organs and general health, and in the use of anti-venereal and anti-scrofulous remedies. In certain cases, an attempt should be made to remove or destroy exostosis of the orbit by operation.

Leeches round the orbit; friction with mercurial ointment, or with a mixture of 1 part of iodide of potassium to 8 of mild mercurial ointment, or of 10 parts of muriate of ammonia to 100 of the same ointment; and mercury and iodine internally, are worthy of trial, especially if a syphilitic taint is supposed to be the cause of the disease. Local depletion, change of air, mild alteratives, iodine, and tonics of different kinds, may be tried in scrofulous cases. Should these means fail, and the disease be so situated that it can be reached, the attending symptoms may demand, that we should either attempt excision of the morbid growth, or endeavour to produce in it an artificial necrosis.

Being well exposed, by an incision, in some cases, through the integuments, and between the fibres of the orbicularis palpebrarum; in other cases, by dissecting back the lids, divided either at the commissure, or vertically, as seems most suitable; the tumour is to be stripped of its periosteum, and removed with a strong scalpel, a small chisel, or a pair of cutting pliers. If it is connected by a kind of pedicle, it will be more easily removed in this way; with much more difficulty, if it grows by a broad basis. The gouge and hammer, the saw, the trephine, and various other instruments, may then be required. In some cases, it may be possible to separate the entire exostosis: in other cases, portions of it merely. It may sometimes happen that it shall be broken into pieces, yet none of these can be got away without severely lacerating, or extensively dividing, the soft parts. If they be left, suppuration will take place round them, and then they will come away. The operation must, of course, be executed very cautiously, lest the thin bones of the orbit be fractured, or any injury done to the eyeball or its nerves, in the attempts to detach the exostosis. The wound made in exposing the exostosis is not likely to heal without suppuration.

In cases where it is not possible immediately to detach an exostosis from the bone whence it grows, it has been proposed to divest the tumour of its periosteal covering, and then leave the new growth, thus deprived of its nourishment, to perish by exfoliation. After stripping the tumour of its periosteum, it may be rasped with a file, or rubbed with caustic, or with nitric acid, so as to render its destruction still more probable. In consequence of this, a scale will drop off, or perhaps the whole exostosis may separate; for unhealthy structures die more readily than healthy. Cases are recorded, in which, after the application of caustic to an exostosis of the orbit, the tumour has in this way mortified, and been thrown off. Yet we must regard this as a practice to be followed, only when immediate detachment of the diseased growth appears impracticable. It is a mode of cure attended with much more pain, and is much less manageable than the use of the chisel or the cutting pliers; and as the tumour is very likely to be nourished by vessels entering its internal, as well as its external surface, it may fail altogether. Ivory exostoses, however, are so hard that even a saw makes little impression on them. Mr. Hawkins thinks it better, therefore, to scrape them, and touch them with nitric acid or pure potass.[7]

Orbital exostoses have sometimes been removed while in the cartilaginous state, lying under the periosteum. Mr. Travers had seen several cases of this description; the tumour presenting at the nasal side and appearing to extend to the bottom of the orbit, its anterior edge thin and bound down by the orbital circumference. From its compressing the eye to blindness and pushing it out of the orbit, he inferred that the tumour probably possessed considerable bulk. He once removed, he tells us, a tumour of this kind, on the nasal side of the orbit, scraping it clean away from the bone. It was of the hardness of cartilage, and of great extent. He is unable to say whether the disease returned, having lost sight of the patient soon after the operation. The impression he had of the case was unfavourable, from the character as well as the extent and connections of the tumour.[8]

Under certain circumstances, it may be advisable to remove the protruded eyeball in cases of exostosis of the orbit; namely, when vision is destroyed, the pain distressing, and the osseous tumour probably so far back in the orbit, that it could not be extirpated. The removal of the protruded eyeball has also sometimes been resorted to, in cases of exostosis of the orbit, when the symptoms were too obscure to lead to any decided diagnosis.

Cases. Although cases of exostosis of the orbit, minutely related, are not very numerous, my limits prevent me from quoting except a few of the most remarkable, each serving to illustrate one or more points of importance.

Case 63. — *Exostosis of roof of orbit, removed by operation.* A female, between 20 and 30 years of age, in good health, applied at the Royal Westminster Ophthalmic Hospital, and stated that, seven months previously, she had noticed her right eye begin to protrude; the projection was steadily on the increase, and the organ was now directed downwards. No pain was felt; vision was perfect; but the disfigurement was so detrimental to her as a servant, that she was anxious for its removal. On examination, it was found that, besides the symptoms mentioned, the orbital ridge was increased in thickness, and a hard tumour, continuous with it, passed downwards and deeply backwards into the orbit, so as to press upon the upper and back part of the eye, causing its projection. Mr. Canton, having put the patient under the influence of chloroform, made an incision from the external to the internal angular process of the frontal bone, immediately below the eyebrow. The integuments, orbicularis muscle, and palpebral fascia having been cut through, the dissection was continued into the orbit and around the tumour, so as to free the latter from the neighbouring and adherent soft parts. A small chisel was then applied to the accessible parts of the base of tumour, which by degrees became detached from the orbital plate, and was withdrawn from between the latter and the upper and lateral part of the eye. Sutures, plaister and water-dressing were applied, and the patient recovered in a week, not having had a bad symptom. Vision on the affected side continued nearly as perfect as the sound one. The exostosis was about the size of a walnut, very heavy, formed externally of compact bone, while its structure within presented a close reticular character.[9]

Case 64.—*Orbital exostosis removed by operation.* A carter, 40 years of age, was admitted under Mr. Haynes Walton's care, at St. Mary's Hospital, with an exostosis growing from the upper edge of the orbit; it had a very broad base, was flattened, and its greatest point of projection measured 2 inches. The upper edge was covered by the eyebrow, which was considerably elevated; the lower edge dipped into the orbit, touched the globe of the eye, and thrusting it downwards and outwards, protruded it about ½ inch beyond its fellow, thereby nearly destroying vision. The inner and outer boundaries were less marked. The surface was tuberculated, and as hard as stone; the skin was moveable, and traversed by a few vessels.

When quite a lad, he had fallen down stairs, and pitched on the front of his head; two months afterwards a little swelling appeared on the orbital ridge, and gradually increased to the extent described. There was no doubt as to its true nature; hardness, immobility, slow growth, continuity with the bone, and absence of pain and inflammation, sufficiently marked the case.

Chloroform having been administered, Mr. Haynes Walton made an incision in the line of the eyebrow, which had been previously shaved, along the entire superior edge of the tumour; a second, from the inner extremity of that to the root of the nose; and a third, from the outer extremity to a little below the level of the outer corner of the lid. The flap thus formed was then dissected down till the lower part of the tumour was reached, when Mr. Haynes Walton passed a narrow saw between it and the eyeball, and sawed from below upwards, endeavouring to follow the natural line of the brow. The texture of the mass was like ivory, and a very long time was occupied in getting through it. The integuments were brought together by suture; union by the first intention followed, except at a central spot of the transverse cut, through which healthy pus was discharged for eight weeks. Ultimately, the eye was restored to its place, sight returned, and very little indication existed of what had been done. The eyebrow, which concealed much of the scar, descended to its proper level, and the lid could be raised nearly to the extent of its fellow.[10]

Case 65.—*Exostosis of the orbit, consequent to an injury, removed with difficulty by operation.* A girl, about 17 years of age, received a blow with a rake, the handle of which entered the left orbit. She immediately fell down insensible, but soon recovered her senses; and on examination a deep wound was found between the upper wall of the orbit and the eye, the upper eyelid having been lacerated. There was not much bleeding. The eyelid did not become affected, and remained free from inflammation during the healing of the wound, which took place in a short time, and without any particular treatment. About 18 months after the accident, the girl felt a tumour forming behind the upper eyelid; but as it was not accompanied by pain, or any other inconvenience, she did nothing for it till it had acquired a large size. At the time when Dr. Salzer saw her, four years had elapsed from the occurrence of the accident. The tumour, by this time, was very hard, immovable, and protruding from the orbit, but still completely covered by the eyelid; the globe of the eye was forcibly pushed aside, and downwards, so as almost to touch the left nostril; sight was not completely destroyed.

The upper eyelid was divided, and the tumour, having been laid bare in its whole breadth, was found of osseous texture, and attached to the orbit, not (as was anticipated) by a pedicle, but by a broad base. The substance of the morbid growth was so dense, that it was necessary to attack it with the chisel and hammer, and even in this way only portions of it could be removed. Towards the end of the operation, which lasted several hours, it appeared that a large piece of bone was loose; but this could not be extracted, though several attempts were made to do so. The patient was bled, and had ice applied over the forehead; she complained of violent pain, apparently from the pressure which the loose pieces of bone exerted on the eye; for as soon as by a proper apparatus this pressure was lessened, the pain and inflammatory symptoms subsided. The osseous fragment, and what remained of the exostosis, having been subsequently removed by the application of the trephine, the muscles and vessels of the eye were found so much flattened, as almost to resemble ligaments; however, after some time the globe began gradually to re-ascend into the orbit, and in six weeks after the operation, recovered its natural position. The sight had not suffered at all. The quantity of bone removed weighed about 2 ounces, after having been dried.[11]

Case 66.—*Exostosis of the orbit destroyed by inflammation excited by the use of caustic.* Brassant's case is often referred to. The patient was a woman, 30 years of age, who had fruitlessly undergone the operation for fistula lacrymalis. Fifteen years afterwards, the os planum and the internal angular process of the frontal bone presented an exostosis of the size of an egg. The globe of the eye, compressed laterally, was thrust out of the orbit, and hung in some measure on the cheek at the temporal angle. Brassant attacked the exostosis with caustic. It suppurated, and within the space of from three to four months, exfoliation of a considerable portion of the bony growth took place. The eye returned to its natural situation, and the cure was ultimately perfect.[12]

Case 67.—*Exostosis exfoliates after repeated operations.* Professor Spöring has recorded a case of osseous excresence, which grew from the bone in the immediate vicinity of the internal canthus. The patient was a man of 35 years of age. The excrescence grew to the size of a very large walnut, pushing the eye nearly out of its socket, and impairing vision. A surgeon tried to remove it by promoting exfoliation; but the wound bled so freely, that he was happy to close it up again. Sometime afterwards, a peasant was allowed to try his skill upon it. He began with an incision round the bone, which caused a great effusion of blood. He afterwards applied to it some secret remedy, which produced intolerable pain for 12 days, attended with faintings. Several months afterwards, however, the patient had the courage to undergo the operation again. In the following spring, the entire exostosis dropped out, the eye returned to its situation in the orbit, and vision was restored.[13]

The difficulty of making any impression on an ivory exostosis, with a saw or trephine, is so great, that in several cases the operation has been abandoned, without being finished. Into an exostosis of this kind, producing protrusion of the eye, Mr. Keate made a perpendicular cut with a trephine, but was obliged to desist from its hardness. The patient continued to attend at St. George's Hospital for several years, and had various caustics applied. Ultimately, a large piece exfoliated, in which, owing to its extreme density, so little change had been produced, that the hole made by the trephine was as distinct as when the man left the operation-room.

Both in this case, and in another, in which Sir A. Cooper had tried in vain to saw off an ivory exostosis from the frontal bone, just at the edge of the orbit, but which ultimately exfoliated after repeated applications of caustic by Sir B. Brodie, Mr. Hawkins remarks that the hollow left by the separation of the tumours produced so odd an expression of countenance, that he doubts if the patients thought themselves much improved by the cure, though it of course prevented the mischief that would have ensued if the disease had continued to increase.[14]

Case 68. — *Operation on an ivory exostosis, abandoned on account of its excessive hardness.* In 1843, I had an opportunity of witnessing a case somewhat similar in its result to those of Mr. Keate and Sir A. Cooper. A labourer was admitted into the Royal Infirmary of Glasgow, under the care of Mr. Lyon, presenting an exostosis, about the size of a pigeon's egg, growing from the roof of the right orbit. The supra-orbital ridge appeared as if forced up by it, while the eye was displaced downwards and forwards. The tumour was exposed by an incision parallel to the fibres of the orbicularis, and the finger was passed below and behind the tumour, which felt distinctly defined. Gouge, cutting pliers, rasp, and paring-knife were tried on its surface, without any effect. A chain-saw was passed behind and around the tumour, but would not work. Hey's saw being applied in front, after considerable perseverance, a cut to the depth of three-quarters of an inch was made into the exostosis in the plane of the roof of the orbit. A lever was passed into the track of the saw, but the tumour did not yield to such degree of force as the fear of breaking up the orbital plate, and injuring the brain, permitted to be used. The portion of the exostosis projecting anteriorly, between the track of the saw and the eyeball, was after some difficulty sawn off, and the wound closed, in the hope that what the operation had commenced, would be finished by necrosis.

Ten years have now elapsed since the operation. The exostosis still remains exposed through the wound, and bears the mark of the saw, as if the operation had been done but yesterday. The portion of the frontal bone to which it is attached feels somewhat loose. The eyeball is entirely extruded from the orbit, and the cornea has become opaque.

The basis of the orbit has been found to be occasionally the seat of exostoses. Sometimes one portion of it, and sometimes another has been affected; but the superior maxillary bone most frequently. Cases of this sort have been described as exostosis of the maxillary sinus. These we shall consider in the next section. In the following case, the whole basis of the orbit seems to have been affected: —

Case 69.— *Cup-like exostosis of the edge of the orbit.* Acrel relates a case of this sort under the title of *spina ventosa* of the right orbit. The bones forming that cavity, especially the frontal and superior maxillary, were so much protruded, as to present the appearance of a blunt cone, four fingers' breadth high, and about the same in diameter at its basis. He compares it to a small cup inverted, in the bottom of which, or end which was turned outwards, was the eye. This was not completely sound and clear, and was smaller than the left eye; it had eyelids, which were moveable, and the other parts belonging to it, and even served to distinguish large objects pretty well. Acrel considered the case incurable. He mentions that he had seen another case of the same sort, for which also he regarded it useless to attempt any operation.[15]

§ 4. *Osteo-sarcoma.*

Osteo-sarcoma, by some called *fibrous exostosis,* and by Sir A. Cooper *fungous exostosis of the medullary membrane*, sometimes attacks the skull, and involves the bones of the orbit.

The disease consists in the development of a tumour, involving the substance of a bone; taking its rise sometimes from the surface, but more frequently within the spongy tissue of the bone affected. The tumour generally consists of a substance much softer than ordinary cartilage, containing numerous slender spiculæ, or thin osseous plates, radiating through it, being partly the original bone expanded and separated into fibres, and partly new unhealthy bone. This disease depends on a particular state of constitution, and is generally regarded as malignant. Mr. Lawrence, however, distinguishes[16] indolent from malignant osteo-sarcoma; the former occupying years before it attains a very considerable size, attended with little pain, and dangerous only in consequence of interfering with the functions of parts, from the magnitude it attains; the latter attended with pain from the first, and growing very rapidly. A similar distinction is made by other surgical authors, between fibro-cartilaginous and sarcomato-medullary exostosis. The latter, or malignant osteo-sarcoma, seems to be encephaloid cancer or fungus hæmatodes occurring in bone; the former is the osteoid tumour of Müller.

In Dr. Hunter's Museum, in the University of Glasgow, two skulls are preserved, which have suffered greatly from osteo-sarcoma. One of them, apparently a male skull, of which no account is preserved, exhibits the whole left side changed by the disease in a most remarkable degree, the spiculæ and laminæ of bone into which it is converted rising at least three-fourths of an inch above the natural level of the bones. The spiculæ project also towards the interior of the cranium, especially from the temporal bone. A small part of the floor of the orbit only remains unaffected, the three other sides being in a great measure destroyed. The other skull, a female one, is figured by Dr. Baillie, in his Series of Engravings Illustrative of Morbid Anatomy.[17] Nine or ten different parts of the cranium are affected in this instance. The middle of the os frontis, the right temporal bone, both parietals, and the frontal behind its right external angular process, are the principal situations of the disease. At the right temple, the disease penetrates into the orbit, and affects in a slight degree the interior of the cranium. In each parietal region, the inside of the skull is much affected, spiculæ of half an inch in length projecting inwards in these situations. In each specimen, the morbid appearances are evidently the effects of a disease springing up in the cancelli, and destroying both tables of the skull.

Case 70. — Sir A. Cooper[18] has given a sketch of an osteo-sarcomatous tumour on the forehead, extending close to the edge of the orbit. Sir Astley persuaded the subject of this tumour to submit to an operation. On removal, it was found exactly of the character above mentioned, and although partly formed of osseous spiculæ, was readily broken down with the finger. The patient became feverish and comatose, and died on the 6th day.

On dissection, Sir Astley found that the swelling occupied the internal as well as the external table of the skull, that it extended through both, and affected the dura mater, which had several fungous projections proceeding from it, and that the inflammation excited by the operation, had extended to the membranes of the brain. The complaint seemed to have originated in the diploe of the os frontis, and to have produced an effusion both between the pericranium and the skull, and between the skull and the dura mater. The swelling, upon the outer part of the head, was, however, much larger than that which had arisen from the inner table. It was evident, too, that this case must have proved fatal, although no operation had been performed.

Sir Astley concludes this case by observing, that an exostosis on the external table of the skull, growing slowly, very little vascular, and unattended with any considerable pain, may safely be made the subject of an operation; but that a swelling of more rapid growth, red upon its surface, showing signs of considerable vascularity, and attended with great pain shooting through the brain, is one for which he should hesitate again to perform an operation.

These latter characters belong not to simple exostosis, but to osteo-sarcoma.

Case 71. — Sir Philip Crampton was consulted by a lady of about 55 years of age, on account of dimness of sight affecting the right eye; the eye felt exceedingly hard to the touch, was affected with strabismus, and projected in some degree from the orbit; the pupil was immovable, but vision was not altogether destroyed. She complained of severe shooting pains in the head and in the right arm; her general health was much affected, and her aspect almost cadaverous; her memory seemed much impaired, and there was a general insensibility to external impressions; she was depressed in her spirits, yet she made but little complaint. On an attentive examination it was plain that there was some fulness in the situation of the temporal fossa, but the tumour was perfectly indolent and incompressible.

Sir P. did not see the lady again for four or five weeks, when he found her nearly comatose; the swelling on the temple had increased to a considerable degree, and the eye was still farther protruded from the orbit. She expired in a few days, and on the day following her death, the head was examined.

On raising the aponeurosis of the temporal muscle, the temporal fossa was found to be occupied by a greyish-coloured substance, of the consistence of brain; the muscle itself had completely disappeared; numerous osseous spiculæ proceeding from the frontal and temporal bones, passed into the tumour, of which they constituted a considerable part. On opening the head, a tumour of precisely the same description, beset in the same manner by bony spiculæ, was found lodged between the dura mater and the internal orbital process of the frontal bone.

On macerating the bone, it exhibited the most perfect specimen Sir Philip had seen of *fibrous exostosis*. The spiculæ proceeding both from the outer and from the inner table of the cranium were each about as thick as a hog's bristle, and three-fourths of an inch in length; they were set as closely together as the hairs of a brush, and extended in an undulating line over a space of about two square inches in extent. The tables of the skull were slightly separated from each other in the part corresponding to the exostosis, and the diploe seemed to contain some of the same brain-like matter which formed the bulk of the tumour.

Sir P. thinks it impossible to decide whether the disease commenced in the soft parts, or in the bone; although it seemed probable that it commenced in the bone, because the spiculæ were furnished by the bone itself, and not by the periosteum or dura mater, which were separated by the tumour to the distance of nearly an inch from the outer and inner tables of the skull respectively.[19]

Sir P. observes that, in malignant osteo-sarcoma, it is more usual to find a deficiency than an excess of bony matter; for although spiculæ of bone are interspersed through the brain-like substance which forms the bulk of the tumour, the bone itself is usually divested of its earthy basis, and is converted into a steatomatous or cartilaginous substance. Sometimes, however, the tendency to secrete phosphate of lime is surprisingly increased, and then large and singularly shaped masses of bony matter are thrown out from the surface of the diseased bone. The presence or absence of bony matter in an osteo-sarcomatous tumour will probably depend, Sir Philip thinks, on the relative activity of the secreting and absorbing systems in the diseased bone. He is also of opinion, that the varieties which are met with in the character and nature of osseous tumours, depend greatly on the kind of constitution of the patient, whether that be healthy, cachectic, or scrofulous.

Case. 72.—Dr. Schott operated in a case, in which the eye was pushed out of the orbit by a fungous growth, arising from the diploe of the great wing of the sphenoid, the outer half of the pars orbitalis, planum semicirculare and zygomatic process of the frontal, as well as the angulus sphenoidalis of the parietal and anterior half of the squamous portion of the temporal. The growth had pushed itself not merely into the orbit and temporal fossa, but into the cavity of the cranium. The operation removed the diseased mass from the orbit and temporal fossa. The patient died in 12 hours.[20]

It is scarcely necessary to add, that in cases of osteo-sarcoma of the orbit, the less that is done the better.[21]

§ 5. *Cysts in the Parietes of the Orbit.*

The bones are subject to two kinds of encysted tumours; viz.:—the hydatid-encysted, containing echinococci similar to those met with in the liver; and the serous-encysted. These tumours are developed in the cancellated structure, and expand the affected bones often to a great size. The frontal and the upper maxillary bones have not unfrequently been found the seat of such diseases; in the latter situation, connected sometimes with the fangs of the teeth.

A remarkable example of hydatid-encysted tumour of the frontal bone is related by Mr. Keate. The tumour projected from the forehead, chiefly over the left orbit, and presented the shape and size of three-fourths of a large orange. The tumour was laid open, and ultimately, about 28 hydatids came away. Twenty years after the last operation, the patient continued well.[22]

In both kinds of encysted tumour, the bone covering the cyst must be freely laid open, and the cyst thoroughly extirpated.

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[1] On tumours of the bones, consult Hawkins' Clinical Lectures, Medical Gazette, vol. xxiii; London 1838, 1839.

[2] Dublin Journal of Medical Science; Vol. ix. p. 255; Dublin, 1836.

[3] Medical Gazette; Vol. xv. p. 265; London, 1835.

[4] Jourdain, Traité des Maladies de la Bouche; Tome i. p. 289; Paris, 1778.

[5] Baillie's Series of Engravings, Fasciculus X. Plate i.: also his Morbid Anatomy, p. 446; London, 1812.

[6] J. P. Frank, Opuscula Posthuma, p. 77, Tab. iv. v. vi.; Pavia, 1825.

[7] Op. cit. p. 500.

[8] Travers' Synopsis of the Diseases of the Eye, p. 227; London, 1820.

[9] Medical Times; Vol. xxiii. p. 494; London, 1851.

[10] Haynes Walton's Operative Ophthalmic Surgery; p. 345; London, 1853.

[11] Quoted from the Neue Zeitschrift für Natur- und Heilkunde, in the Lancet for 1831; Vol. i. p. 671.

[12] Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 277; 12mo; Paris, 1774.

[13] Quoted from Haller by Mr. B. Bell, in his Treatise on the Diseases of the Bones, p. 121; Edin. 1828; referred to also by Acrel. I have not been able to find the original account of the case.

[14] Op. cit. p. 500.

[15] Acrel, Chirurgische Vorfälle, übersetzt von Murray; Vol. i. p. 102; Göttingen, 1777.

[16] Lectures on Surgery, Medical Gazette; Vol. vi. p. 454; London, 1830.

[17] Fasciculus X. Plate i.; London, 1799.

[18] Surgical Essays, by Cooper and Travers, vol. i. p. 212; London, 1818.

[19] Dublin Hospital Reports; Vol. iv. p. 554; Dublin, 1827.

[20] Controverse über die Nerven des Nabelstrangs; advertisement at the end; Frankfurt am Main, 1836.

[21] The reader will find a remarkable case of degeneration of the bones of the cranium and face, involving the orbit, related and figured by Cruveilhier, Anatomie Pathologique; Tome i. Livraison 21. He considered the affection as cancerous.

[22] Medico-chirurgical Transactions; Vol. x. p. 278; London, 1819: Hawkins, Op. cit. p. 471.

SECTION IV. — DILATATION, DEFORMATION, AND ABSORPTION OF THE ORBIT, FROM PRESSURE.

When an abscess or a tumour forms within any of the osseous cavities of the body, pressure slowly dilates even the bones, thins them, softens them, and forces them to give way. The bones of the cranium are not exempt from these changes, and have been known to allow a tumour of the brain to protrude externally. Dr. Donald Munro has related a case of this kind, in which a tumour of the brain protruded through the os frontis[1]; and Mr. Hunter has noticed a case in terms so exactly similar, that it is likely it was the very same which was seen by Dr. Munro. Mr. Hunter thinks that the tumour had probably formed in the pia mater. It was oblong, above an inch thick, and two or more inches long. It was sunk nearly its whole length into the brain, seemingly by the simple effects of pressure; but the outer end of it, by pressing against the dura mater, had produced the entire absorption of this membrane at the part pressed upon. The same irritation had been communicated to the skull, which was also absorbed; after which, the same disposition was continued on to the scalp. As these respective parts gave way, the tumour was pushed farther and farther out, so that its outer end came to be in the passage which the absorbents were making for it in the scalp, by which it probably would have been discharged in time, if the man had lived; but it was so connected with the vital parts, that the man died before the parts could relieve themselves. While all these exterior parts were undergoing absorption, the internal parts which pressed upon the inner end of the tumour, and which pressure was sufficient to push it out, did not in the least ulcerate, nor did the tumour itself, which was pressed upon on all sides, in the least give way in its substance. No matter had been formed, neither by the dura mater, the edge of the bones of the skull, nor that part of the scalp which had given way. The general effect, however, was similar to the progress of an abscess, insomuch that it was on the side nearest to the external surface of the body that the irritation for absorption had taken place.[2]

The process by which an abscess or a tumour is thus brought to the surface of the body, Mr. Hunter regarded as a combination of interstitial and progressive absorption — *interstitial,* because particles from the interstices only of the part, are for a time removed, the part still remaining—*progressive,* on account of the tending to the surface, till at length the surface gives way, and the abscess or the tumour finishes its progress by being exposed or evacuated. By the process in question the internal parts of the body are, to a certain extent, protected from the intrusion of such diseases, and in many cases a cure is effected by the discharge of the morbid accumulation or growth. Hence Mr. Hunter called interstitial and progressive absorption, the *natural surgeon.*[3]

If, then, the thick bones of the cranium are forced to yield, how much more readily will the bones of the orbit suffer from the same process, excited either from within that cavity, or without, from the surrounding cavities, the nostril, the frontal, maxillary, and sphenoid sinuses, or the cranium!

§ 1. *Pressure on the Orbit from within the Orbit.*

Various causes within the orbit may, by pressure, produce dilatation and absorption of its walls. I have seen the orbit slowly enlarged by the growth and pressure of a diseased lacrymal gland, till it was of size sufficient to contain the fist, and at several points had given way. Effused blood, collections of matter, aneurisms, enlargements of the eyeball, encysted and other tumours, are all capable of producing such effects.

If pressure from within the orbit is sudden, it will in some cases produce inflammation of the bones, and caries; but if carried on slowly, perhaps during the course of many years, dilatation and absorption, without any formation of matter, and even without inflammation, will be the effect. It sometimes happens, however, that after the orbit has been slowly dilated, and perhaps partly absorbed, in consequence of the pressure of a morbid growth within it, the tumour begins to inflame and form matter, and this action, spreading to the surrounding parts, brings on caries. If it is the roof of the orbit which becomes affected in this way, the dura mater inflames and secretes pus; the brain participates in the disease; to fever, there are added delirium and coma; and death follows more or less speedily.

§ 2. *Pressure on the Orbit from the Nostril.*

1. *Nasal polypus.* The nostril communicates with the orbit by the lacrymal passage. The os unguis and os planum of the ethmoid form a thin partition between these cavities; a partition which, but for the tendency already referred to, which morbid growths have towards the external surface, would often be broken through by nasal polypus. This tumour, after filling the nostril in which it has originated, dilates it at its anterior opening, pushes itself backwards, so as to appear behind the veil of the palate, and presses the septum narium aside, so as to amplify the cavity of the one nostril at the expense of the other. It is not, in general, till the nostril is in this way greatly dilated, and of course the face much disfigured, that the polypus pushes itself through the os unguis, and projects, covered by the inflamed integuments, in the situation of the lacrymal sac. Previously to this, however, the passage for the tears is obstructed, and a painful feeling of pressure experienced in the orbit and through the head. If the polypus continues to advance, the nasal bones will be separated from the superior maxillary, the orbit will be still more intruded upon, the eyeball displaced, vision lost, and at last even the cavity of the cranium giving way, the morbid growth may come into contact with the brain.

Nasal, much more rarely than antral, polypus is the cause of deformation of the orbit, and of such destructive effects as I have just now enumerated. Antral is apt to be taken for nasal polypus; and I strongly suspect that, in several recorded cases, this mistake has been committed. In all cases of exophthalmos, or protrusion of the eye, it is necessary carefully to examine the nostril with the finger and the probe, lest polypus of the nose or of the antrum be the cause. Antral polypus, having by pressure destroyed the bones and mucous membrane which separate the antrum from the nose, sometimes pushes its way into the nostril, and imitates a nasal polypus; nay, I have known a polypus of the antrum to traverse both nostrils, and project at the inner angle of each orbit.

I do not conceive it necessary to enlarge on the treatment of nasal polypus. Early extirpation ought to be practised.

2. *Exostosis between nostril and orbit.* In the following case, the orbit was displaced by an osseous tumour, which was ultimately removed by spontaneous separation. This case, and one of osseous tumour in the orbit, to be noticed, along with other orbital tumours, in a following Chapter, appear to have been exostoses, growing by narrow necks, which at length giving way, left the tumours free. It is a fact of much practical importance, that the surface of the attachment of an exostosis scarcely ever extends, but that the increase of the tumour takes place chiefly or only upon its periphery.[4]

Case 73. — When Thomas Moore was about 13 years of age, a little pimple, like a wart, appeared under his left eye, close to his nose. He scratched off the head of this pimple, which formed a scab. This was followed by a tumour, which grew for 23 years. The tumour, although slow in its progress and free from pain, gradually became more conspicuous, and at last produced great disfigurement of the face. The septum nasi was pushed towards the right side, so as nearly to obliterate the right nostril; the turbinated and cellular apparatus on the left side of the nose was destroyed; and the left orbit was thrust outwards.

After a time, the tumour displaced the inner wall of the orbit; and the globe of the eye, being thus subjected to pressure, became the seat of most excruciating pain, though vision was very little impaired. When the patient was about the age of 19, the eye, yielding to the pressure, burst, and discharged its fluid contents. In less than an hour after this took place, the patient, who had been deprived of rest during several weeks, was buried in profound sleep. He awoke nearly free from pain; and this comparative ease continued.

When he had reached the age of 30, the tumour was observed to be somewhat loosened, and to be becoming detached by ulceration of the surrounding soft parts. The process of detachment was alleviated by copious suppuration, and occasionally by profuse hæmorrhagy from the vessels of the adjacent structures. For a time, the tumour was retained merely by bands of integument, which it would have been easy to divide. At length, several small irregular portions of bone came away; but the large mass continued to be maintained in its situation until the transverse bands were divided by ulceration, when to the patient's astonishment, the whole tumour fell from his face. Neither pain nor bleeding attended this separation; but a large chasm was left between the nose and the orbit, bounded below by the nasal surface of the hard palate, and the floor of the left antrum, above by the left frontal sinus and left half of the cribriform plate of the ethmoid bone, internally by the septum nasi, which presented a concave surface, with a small opening through its lower part, communicating with the right nostril, and externally by the left orbit. Posteriorily, the chasm opened into the pharynx.

When Mr. Hilton drew up his account of the case, the roof, the outer wall, and part of the inner wall, were covered with granulations. On comparing the distances from the median line of the face to the malar edge of each orbit, that on the left side was found to be nearly an inch greater than that on the right. The left eyebrow was elongated in the same direction for about half an inch; and the cerebral cavity appeared to be encroached upon by the pressure of the tumour upwards.

The tumour weighed 14¾ oz. Its specific gravity was 1·80. Its greatest circumference measured rather more than 11 inches, and its least 9 inches. Externally it was undulated, and its posterior surface concave. A section of it presented a very hard surface resembling that of ivory, with lines, to the number of fifty, arranged in concenctric curves, enlarging as they proceeded from the posterior part of the tumour.[5]

§ 3. *Pressure on the Orbit from the Frontal Sinus.*

If we consider that when the frontal sinus is large, independently of disease, it separates the orbitary plate of the frontal bone into two laminæ, as may not unfrequently be observed in the skulls of old persons, and sometimes in the young, it will not appear strange, that the pressure of a diseased and dilated frontal sinus should deform the orbit, displace the eyeball, destroy vision, and ultimately disorganize the bones upon which the pressure is exercised.

The frontal sinus, like the maxillary, is liable to several different kinds of disease; namely, 1st. Inflammation of its lining membrane, ending in a collection of matter, which may be either thin, or thick and curdy; 2nd. Encysted tumours, or what some have chosen to call hydatids; 3rd. Tumours, more or less solid, which are considered to be of the nature of fungus or polypus; 4th Exostosis.

1. *Inflammation of the frontal sinus, ending in a collection of matter.* The frontal sinus, on each side, is lined by a thin fibro-mucous membrane, a continuation of that which lines the nostrils. The two sinuses are separated by a bony partition, which rarely runs in the course of the middle line; so that, in general, the one sinus is larger, and, in many instances, much larger, than the other. Each sinus communicates with the middle meatus of the nostril, through the medium of the anterior ethmoid cells. The communication is narrow and indirect. Whether the diseases of the frontal sinuses are mainly, or frequently, or at all, to be attributed to accidental closure of this communication, I shall not pretend to say. Beer has mentioned sudden suppression of severe catarrh, as a cause of matter collecting within the sinuses. It is known, that in cases of wounds penetrating into these cavities, their lining membrane inflames, and secretes a white puriform mucus, which has sometimes been mistaken for the substance of the brain. Cold, and the other causes which give rise to the inflammation of mucous surfaces, may also affect the lining membrane of these cavities; and in scrofulous constitutions, curdy pus will be apt to collect there, as it often does in the maxillary sinuses.

Suppression of the natural discharge of the Schneiderian membrane, or of that discharge when increased by disease, seems occasionally to be the cause of amaurosis[6]; probably through the medium of cerebral congestion.

It is scarcely necessary for me to quote examples of simple suppuration of the frontal sinuses; I shall refer the reader to the cases related by Runge[7] and Richter.[8] One of these recovered after the diseased cavity was opened externally; another, after bursting of the matter into the nostril; while a third proved fatal after spontaneous discharge of the matter through the external table of the frontal bone, and through the middle of the upper eyelid.

In the early stage of inflammation of the frontal sinuses, the obscurity of the symptoms will rarely permit any decided judgment to be formed of the case, or any active treatment to be adopted. In all the three cases to which I have referred, the disease had advanced, either to a considerable protrusion of the outer wall of the affected sinus, or even to the giving way of the cavity, and the evacuation of the contained matter, before any suspicion seems to have been excited. Leeches to the inside of the nostrils, and other antiphlogistic means would, of course, be adopted, were we called in early enough, and did the pain, and other symptoms, appear to indicate inflammation of the lining membrane of the sinus. Emollient, and afterwards, stimulating vapours drawn up into the nostrils, might be tried. If they succeeded in exciting a considerable discharge from the Schneiderian membrane, this might tend to relieve the inflamed state of the sinuses.[9]

In the suppurative stage, perhaps counter-irritation, and a variety of other measures, might prove useful.

The last stage, in which the frontal bone becomes deformed, thinned, softened, so that it yields to external pressure, like a piece of elastic cartilage, or is even perforated by absorption or by caries, can scarcely be mistaken. The opening, however, which is formed in the bone, and ultimately in the integuments, is not above, or on a level with, the eyebrow, where a careless examination of the anatomy of the frontal sinuses might lead us to expect it, but close to the inner canthus, or beneath the middle of the superciliary arch; so that, sometimes, the case might be mistaken for a disease of the lacrymal sac, till the probe, taking a direction upwards and backwards, showed the true nature of the case. In a patient of the Glasgow Eye Infirmary, the first symptom which attracted notice was the abscess pointing under the skin, immediately above the tendon of the orbicularis palpebrarum. No pain had attended the first stage of the disease. A large quantity of thick pus was discharged for a length of time. The eye was not affected.

In this stage there cannot exist any doubt about the propriety of extensively laying open the sinus, either with a strong curved knife, or a small trephine, evacuating its contents, endeavouring to improve the state of its lining membrane, by lunar caustic injections and the like, and then allowing the parts to granulate and heal.

In one instance in which Beer trepanned the sinus, not merely was that cavity restored completely to its natural state, but the eyeball returned to its proper place in the orbit, and vision was recovered. In a second case, in which the external appearances were not nearly so alarming as in the former, after opening the outer table, he found, on examining cautiously with the probe, that the inner was softened, and even drilled through; in this case the eye was totally blind, and Beer endeavoured merely to check the progress of the disease, by making a counter-opening through the conjunctiva, above the eyeball. In a third case, the symptoms were decidedly those of a collection of puriform mucus in the sinus, but the patient would hear of no operation. Five weeks after Beer's first visit, the outer wall of the sinus gave way of itself; and in the course of two weeks more the eye was lost, and a great portion of the orbit and of the nose destroyed by caries. The other eye remained completely amaurotic.[10]

2. *Encysted tumours, or hydatids, of the frontal sinus.* Professor Langenbeck has published two cases of pressure on the orbit from disease in the frontal sinus. He speaks of them as cases of hydatid; a term much misapplied by some of the German pathologists. Runge would have probably regarded them as cystic or encysted tumours; perhaps the one was nothing more than a collection of mucus, and

the other of thick matter. The situations of the protrusion of the outer table of the bone, are amongst the most remarkable circumstances of these cases.

Case 74. — F. Reingarten, aged 17, enjoyed perfect health till she was 8 years of age, when having fallen into the water one hot day in 1802, she was seized next day with convulsions, followed some days after by an eruption. This was probably measles, but they ran an irregular course. In the autumn of the same year, she fell, so that her right temple struck against the sharp corner of a table, soon after which a hard swelling appeared in the region of the right frontal sinus. Devoid of pain, it gradually extended towards the right temple, and involved the whole right side of the frontal bone. The right eye speedily became displaced by the swelling, in a direction outwards and downwards, and the power of vision gradually decreased.

In November 1818, when the patient applied at the Surgical Hospital of Gottingen, the swelling extended upwards as far as the coronal suture. The orbital edge of the frontal bone, the eyeball, and the orbit were pressed downwards. The eye was covered by the eyelids, and not pressed out of the orbit, so that properly no exophthalmos existed; but the orbit rather, along with the eye, was pressed forwards, outwards, and downwards, so that the eye was in a line with the point of the nose. The fissura palpebrarum had a crescentic form. The eyeball could with difficulty be moved a little towards the nose; it preserved its natural form, and was not atrophic, but completely amaurotic. Although the swelling was on the whole hard, yet in the temporal region, and above the eye, it yielded to the pressure of the fingers, and immediately rose again, when the pressure was relaxed, as if one were pressing the lid of a tin box. The swelling was entirely free of pain, except when one pressed hard on it, above the nose. That the swelling did not extend in the direction of the brain was evident from their being no sign of any disturbance in the cerebral functions. There was no headache, vomiting, vertigo, insensibility, or coma, and the general health was good. From its situation, its hardness, and the circumstance that at certain points a thin lamina of bone could be depressed with the finger, and from the brain being free from suffering, it was concluded that the swelling depended on the frontal sinus being dilated, and filled with some morbid product.

Langenbeck proceeded to open the swelling on the 2nd December 1818. At the place where the tumour yielded to pressure, he divided the integuments by a crucial incision. The outer table of the frontal bone was next penetrated by a perforator; and through the aperture thus made, a pair of forceps was applied so as to break away some pieces of the outer table. Through the opening there was discharged a clear ropy lymphatic fluid, escaping from a white shining cyst, which filled the whole frontal sinus, and which had been penetrated by the perforator. The cyst, or hydatid as the narrator of the case styles it, was laid hold of with the forceps and partially extracted.

In order to ascertain the dimensions of the cavity, a measure was introduced. From the opening to the orbitary process of the frontal bone, it measured three inches; to the frontal sinus of the opposite side, and to the posterior wall of the cavity, three inches and a half. With the finger the posterior wall of the sinus was distinctly felt. The anterior wall was thin and spongy. The cyst was thick, and where it had been attached, almost cartilaginous. Internally it formed several lobes, containing a yellowish fluid.

The sinus was filled with lint, and after some days discharged a quantity of thin ichorous matter, for which injections of willow-bark decoction, with myrrh, were employed. After a time injections containing corrosive sublimate were used; but, bringing on salivation, they were omitted. The internal treatment was at first antiphlogistic; but when the ichorous discharge came on, bark was given. The swelling subsided only in an inconsiderable degree when the patient left the hospital. In winter 1819-1820, she returned, with the swelling in the same state, and the discharge of matter still as abundant. Langenbeck now passed two setons through the sinus, by which means the discharge and the swelling diminished.[11]

Case 75. — A ploughboy, 20 years of age, 11 years before his admission into the hospital, had, while playing at tennis, received a stroke with a racket on the left side of the nose, and on the left eye, the consequence of which was a great degree of swelling, which, after a time, completely disappeared. Two years afterwards, he began to feel pain in the part, and observed a protuberance at the inner angle of the eye.

When the patient came to the hospital, Langenbeck found the eyeball natural in form, the power of vision not affected, and the pupil lively. The eyeball, however, was pressed outwards and downwards, by a considerable swelling at the inner angle of the eye. The swelling had exactly the appearance and the situation of a greatly distended lacrymal sac, but was considerably bigger than we almost ever find the sac, even in its state of greatest enlargement. That this swelling did not consist in an enlarged lacrymal sac, Langenbeck concluded from his not being able to empty it, no mucus or tears being evacuated from the puncta on pressure, and the tears being duly conveyed into the nostril, without dropping upon the cheek. The patient's voice was similarly affected as that of one with polypus in the nose. The swelling communicated an obscure impression of fluctuation. At the inner side of the swelling, or towards the nose, it was bounded by a sharp edge of bone, which was felt exactly where the nasal process of the upper maxillary bone rises by the inner side of the orbit. As the surface of the swelling was not covered by any layer of bone, but felt soft and fluctuating, it was not easy to form a proper judgment regarding its seat, and one might have readily fallen into the error of supposing it to be an enlarged lacrymal sac. Against such a supposition, no doubt, there was the remarkable displacement of the eye outwards and downwards. As the swelling also extended from the inner angle upwards and towards the frontal sinus, Langenbeck concluded that that cavity was the seat of the disease.

An incision being made from above downwards, close to the sharp edge of bone which was felt at the inner side of the swelling, and in such a way as to avoid both the lacrymal sac and lacrymal canals, after the soft parts were sufficiently divided, a white glistening sac came into view. On touching this with the finger, it was evident that it contained a soft mass. Langenbeck separated the swelling as much as possible; but as he found that it extended deep into the nostril, he opened it, whereupon there issued from it a greyish-white tenacious substance. He cut away with the scissors as much as he could of the sac, and introduced his finger into its cavity. Its depth extended to 3 inches. With the point of his finger he reached as far as the floor of the nostril. He could not reach the orbit, nor touch the eyeball. He felt from the diseased cavity the inner wall of the orbit, formed by the os planum of the ethmoid, a part of the orbitary plate of the frontal, and the os unguis. This wall of the orbit, along with the lacrymal sac and nasal duct, was pressed outwards; hence arose the displacement of the eyeball, while the passage of the tears into the nose continued uninterrupted. Langenbeck introduced his forefinger up into the frontal sinus. He decided, therefore, that the disease had originated there, and had descended by the side of the nostril. He could now see into a large cavity filled with a greyish-white tenacious mass, which he removed with his finger and a pair of forceps. This substance was contained in a shut sac, distinct from the mucous membrane of the sinus; and had it not been so, he thinks the substance in question would have made its way into the nostril. As has already been mentioned, the swelling was not covered by bone at the inner angle of the eye. It must, therefore, he thinks, have made its way, either between the os unguis and nasal process of the superior maxillary bone, or it must have produced the absorption of the latter. This is the more probable conjecture, as the edge of the nasal process felt so sharp. The tenacious substance, which was extracted, was enough to fill a tea-cup.[12]

3. *Polypus of the frontal sinus.* Polypus has been found in the frontal sinuses, the same disease existing in the neighbouring cavities at the same time. It is quite conceivable, however, that a polypus might occupy one or other of the frontal sinuses, without any tumour of the same sort existing in the nostrils or maxillary sinuses; and that slowly dilating the cavity in which it took its origin, it might displace the eyeball, and attenuate and soften the external table of the frontal bone. Under such circumstances, the sinus should be opened; and as polypus is often attached by a narrow neck to the mucous membrane which gives it birth, the tumour might probably be extirpated with success.

Case 76. — A boy, aged 10, was put under Dr. Wuth's care, on account of a disease of the left eye, under which he had laboured 9 years. The eye was so entirely pushed out of the orbit, that it lay on a level with the back of the nose. Its lateral displacement projected it so much over the cheek-bone that, viewed in front, it hid the neighbouring side of the face. Its displacement downwards brought it into a line with the point of the nose. For the last three years, it had closed less and less completely, and the lids now covered it so imperfectly that the cornea, with a circumference of sclerotica four lines broad, remained constantly exposed. A large, deep ulcer of the cornea threatened a speedy disorganization of the eyeball.

The regions of the frontal and nasal bones were greatly protruded. The eyeball had gradually quitted its natural place, in proportion as the orbit had become contracted by the pressure exercised upon its constituent bones. The left side of the nose formed one flat surface with the back of it, and a firm obstacle presented itself to the finger passed into the left nostril. From the stretching of the skin, the left eyebrow was separated widely from the right, and dragged downwards. The skin itself was thickened and doughy to the touch, while at the outer-under part of the eyebrow was a small opening, from which, on pressing the surrounding region, a whitish mucus welled out.

Dr Wuth, being of opinion that a large polypus occupied the frontal sinus, proceeded to remove it by making first a vertical incision, 2 inches long, from the root of the nose upwards through the soft parts; and then a horizontal one, also 2 inches long, close above the eyebrow. He next dissected back the triangular flap thus formed, so far as to permit the frontal sinus to be trepanned. In the middle of the superciliary arch was a small hole in the bone, opening into the sinus, and explaining the source of the fluid already mentioned. In consequence of the great dilatation of the sinus, it was necessary to make two openings into it with a small trephine, whereupon an immense quantity of polypi protruded, and were removed. The cavity in which they were contained would have held three hen-eggs.

The healing of the parts occupied twelve months, the frontal sinus being by that time considerably lessened in all directions, and the eye having partially retreated into the orbit. The ulcer of the cornea soon cicatrized. From the first night after the operation, the patient enjoyed sleep, such as he had not had for years, and he speedily improved in health.[13]

4. *Exostosis of the frontal sinus.* I know of no recorded case of this sort. By chance, I possess two preparations, each showing a small exostosis in the frontal sinus.

§ 4. *Pressure on the Orbit from the Maxillary Sinus.*

The diseases of the maxillary are upon the whole analogous to those of the frontal sinus. They are more frequent, more variable, and generally more easily recognised. They dilate the cavity of the sinus, thin by pressure the bones which form its walls, and force them at last to give way. They disfigure the face, displace the eyeball, and, if neglected, prove fatal.[14]

1. *Collections of mucus or of pus within the maxillary sinus.* A thin continuation of the Schneiderian membrane passes from the upper part of the middle meatus of the nostril, through a narrow aperture, into the maxillary sinus, and forms its lining membrane. The fluid secreted by this membrane is in health discharged into the nostril, as one lies on the opposite side; but is apt to accumulate, constituting what some have called *dropsy of the sinus;* in other cases, this cavity is filled with thin puriform mucus, or with thick curdy pus. Obstruction of the communication between the sinus and the nostril, cold, blows, affections of the teeth, small-pox, and various other causes, have been mentioned as giving rise to these diseased accumulations, which have often been known to increase so much as greatly to dilate the

sinus, elevate the floor of the orbit, and force the eyeball forwards from its place. The matter may be discharged by the alveoli, or into the orbit, or by an opening which it makes for itself through the fossa canina. As an important diagnostic sign it may be mentioned, that in cases of mucous or purulent collection within the sinus, or of accumulation of fluid in a cyst developed in the substance of the bone, the external bony shell generally becomes so thin as to yield and crackle under pressure, like the lid of a tin box. This symptom is wanting in exostosis, and also generally in fungus or polypus of the maxillary sinus. It is right, however, never to depend entirely on external diagnostic signs in diseases of the antrum; but always, before proceeding to any further operation, to perforate, or attempt to perforate the tumour, so as to ascertain its nature. In a case related by M. Gensoul, the incompressibility of the tumour led him to suppose it to be bony, and he was proceeding to the excision of the upper maxillary bone, when, on plunging a pair of scissors into the swelling, it proved to be a collection of mucus, within the antrum.[15]

When, in consequence of obstruction of the nasal aperture of the antrum, a simple accumulation of mucus takes place within the cavity, a swelling is apt to form behind the ala nasi and into the nostril, on puncturing which within the nostril, a large quantity of glairy fluid is discharged. If the natural aperture is now restored, well and good; but if this does not happen, the aperture which has been made with the lancet, or with a sharp point of pure potash, continues patent, and the discharge, becoming purulent, may continue for years. Not being entirely evacuated, however, by such an aperture, the walls of the antrum may become thinned and elevated about half an inch below the edge of the orbit, the molares and dens sapientiæ get loose, and pus ooze through the alveoli; the roof and the floor of the cavity may soften, the bones become bare internally, and caries ensue.

For an example of apparently simple accumulation of mucus within the maxillary sinus, I may refer to a case which occurred to M. Dubois : —

Case 77.—The patient, when a boy of 7 years of age, was observed to have a hard round tumour, about the size of a filbert, near the root of the nasal process of the left upper maxillary bone. It gave no pain, and did not appear to be increasing. A blow, however, which he received about a year after by a fall, excited this tumour to grow, which it did by almost insensible degrees till he was 15. It then began to enlarge more evidently and to cause slight pain. By the time he was 18, it was so considerable in size as to raise the floor of the orbit, so that the eye was pressed upwards, and appeared less than the other, on account of the limited motion of the lids. The palate was depressed, so that it formed a swelling of about the size of an egg divided longitudinally; the nostril was almost completely closed, and the nose was twisted to the right. The cheek was prominent; and the skin below the lower eyelid, and covering the upper part of the tumour, was of a livid colour, and seemed ready to give way. The upper lip was pushed upwards, and the whole length of the gums on the left side had advanced beyond the level of those on the right. Breathing, speech, mastication, and sleep, were impeded.

Sabatier, Pelletan, and Boyer being called into consultation, the unanimous opinion appears to have been that this was a case of fungus of the maxillary sinus, requiring an operation. So much thinned was the bone behind the upper lip, that Dubois felt there a degree of fluctuation, and proceeded to open the sinus at that place, expecting merely to give issue to a small quantity of ichorous fluid, and then to encounter the fungous tumour. The opening, however, allowed a very considerable quantity of ropy substance to escape, similar to what is found in ranula. The probe being passed into the opening, entered evidently a large cavity, quite free of any kind of fungous or polypous growth. It is probable that the opening made at this first operation, if kept from closing, would have served for the complete cure of the disease; but Dubois appears to have thought differently, and proceeded, five days afterwards, to extract three teeth, and to remove the corresponding portion of the alveolar process. This enabled him, on placing the patient in a favourable light, to see the whole interior of the dilated sinus, at the upper part of which, and near to the edge of the orbit, he discovered a canine tooth, which he extracted. After this, the cavity gradually shrunk; the tumour of the cheek, that of the palate, and the displacement of the nose, continued for some time; but after 17 months no deformity existed.[16]

A collection of pus within the maxillary sinus, whether produced in consequence of primary inflammation of its lining membrane, or of inflammation excited by diseased teeth, which is more generally the case, is not unfrequently evacuated in part through the opening of the sinus into the nostril; much oftener, however, that opening appears to be obstructed, so that the pus oozes through the alveoli, or collects and distends the sinus, producing a series of symptoms similar to those which occur in cases of simple mucocele of the antrum.

Case 78.—Some years ago, I had under my care a gentleman, in whom the left maxillary sinus was distended to such a degree that the face was strikingly deformed, the bone absorbed at the most prominent part of the cheek, and the eye partially displaced. I directed the second molaris, which was in a decayed state, to be removed; and through the aveolus, I perforated the sinus so as to give exit to a considerable quantity of purulent fluid. I then pushed up a lacrymal style into the opening, removing it every day and injecting the sinus with tepid water. Under this treatment, the secretion of matter ceased, and the sinus shrunk to its natural size.

In neglected cases of suppuration within the maxillary sinus, various parts of its walls are apt to be absorbed, in consequence of the pressure of the accumulated pus, or rendered carious from inflammation. The floor of the orbit sometimes suffers these changes. The matter, issuing from the sinus, infiltrates behind the lower eyelid, which swells and inflames, sometimes in the neighbourhood of the lacrymal sac, and at length there is formed a fistulous opening through the eyelid, by which matter is from day to day discharged. Perhaps the patient is brought to us in this state, when on passing a probe along the fistula, we readily ascertain that it enters a diseased maxillary sinus.

Case 79.—In a case of this sort, in which the eye was already lost and the floor of the orbit fistulous, Bertrandi, having introduced a probe, or slender perforator, along the fistula into the maxillary sinus, directed it as perpendicularly as he could against the inferior wall of that cavity, and while with two fingers of his left hand he pressed against the roof of the mouth, he pushed the instrument through the alveolar process from above, between the last two molares. After this operation, the pus ceased to flow by the fistula of the orbit, and the patient recovered.[17]

The mode of operating followed in this case may be adopted when the jaws, as is sometimes the case, cannot be sufficiently separated to permit a similar opening into the sinus to be made from below. Wherever the opening is made, whether at the fossa canina, or through one of the alveoli, it ought to be kept patent, either by a dossil of lint, a lacyrmal style, or a silver canula, which is to be withdrawn daily, and the sinus injected either with water or a weak solution of nitrate of silver. The patient may also use a gargle frequently, and press it up into the antrum.

Cases of suppurating maxillary sinus have sometimes been successfully treated by the introduction of a seton through the dilated cavity, although this is not a practice to be much recommended. The seton is passed either through openings in the bone already formed in the course of the disease[18], or by new perforations. Weinhold penetrates from the outside of the cheek into the diseased antrum, and brings out the perforating instrument on the palate[19]; Hedenus separates the cheek from its connexion with the superior maxillary bone, and then pushes a strong needle, armed with woollen threads, through the diseased cavity.[20]

In some instances, where the cavity was much dilated, a cure has been effected by practising an extensive opening into the side of the antrum above the alveoli[21]; and in others, only after considerable exfoliations of its walls.[22]

2. *Polypus or fungus of the maxillary sinus.* It may not be possible to recognise this very serious disease in its incipient stage; but as it advances, it always affects the neighbouring parts in such a way as to render evident the nature of the case, and vindicate the employment of an effective surgical treatment. The dilated sinus is changed in form; the teeth belonging to the affected bone become loose, or fall out spontaneously; the alveolar process becomes spongy, and from its cavities there sprout out fungous granulations; there is frequent bleeding from the corresponding nostril; respiration through that nostril becomes impeded; and on inspection, a polypous mass is found stretching into it from the antrum; often the same growth raises and destroys the skin in the situation of the lacrymal sac; sometimes it extends across the nostrils, producing by its pressure the absorption of the septum narium, and projects at the inner angle of the opposite eye also; the cheek is greatly dilated and deformed, and at length the prominent point of the bony shell gives way; the floor of the orbit is destroyed, and the eyeball is pushed upwards and forwards from its place; the palate is softened and depressed; if nothing is done to remove the polypus, frequent hæmorrhagies weaken the system, hectic fever comes on, and death closes the scene.

The order in which the symptoms occur varies in different cases. Sometimes a violent feeling of toothache is the first symptom; sometimes a swelling in the seat of the lacrymal sac; sometimes a bleeding from the nose. Frequently, the patient has been conscious of a stuffing of the corresponding nostril for years. Then, there follows violent itching of the lower eyelid near the margin of the orbit; to which are added fulness and hardness there, protrusion of the eyeball, œdema of the conjunctiva, and the appearance of a polypus in the nostril. Attempts are made, perhaps, to tie, or to twist off the polypus; and it is then discovered to sprout from the interior of the antrum. The patient may present himself with a fungous growth in the seat of the lacrymal sac, the nostril being filled with the polypous growth from the antrum, but the antrum itself not dilated. I have known such a case taken for an exostosis of the ethmoid bone, and operated on as such. For years, the patient has sometimes noticed that one side of his face felt differently from the other, especially in shaving.

In general, no exciting causes can be fixed on by the patient. In one case, a blow on the face with a rope, seven years before, was mentioned as likely to have been the cause.

It scarcely admits of doubt that there are essential differences in the nature of the polypous or fungous growths, which are met with in the upper maxilla or within the antrum. The success which has attended the treatment in some cases, in which the tumour has been slowly destroyed, and the fatal result in other cases where extirpation of the tumour, or even excision of the upper maxillary bone, has been accomplished, would lead us to this conclusion. There is reason to believe that the most frequent, as well as the most dangerous diseases of the antrum, partake of the nature of encephaloid cancer or fungus hæmatodes, which in some cases seems to be formed entirely within the cavity, proceeding from the mucous membrance, and in its progress destroying the bones; while, in other cases, the bones appear to be first affected, so that the disease is a malignant growth developed within the substance of the bone, and, in fact, osteo-sarcoma. I have also known the disease to be developed at the same time within the antrum, and in the periosteum at the lower edge of the orbit.

The bones which are implicated vary also in different cases; for sometimes the disease is confined to the upper maxillary bone, while in others the sphenoid gives rise to the tumour, which pushes itself forwards into the antrum and the orbit.

That the direction of the pressure of a fungus within the antrum, is different in different cases, is a fact of which I am convinced from cases which have come within my own observation. In some, chiefly children or adolescents, the principal protrusion is forwards and outwards, so that the floor of the orbit is less disturbed; in others, the pressure is chiefly inwards, so that the tumour speedily makes its appearance in the nostril, destroys the septum narium, and rises into view at the inner canthus of each eye, covered only by the integuments; while in a third set, and these chiefly old people, the fungus makes little or no pressure outwards, but proceeds inwards and upwards, causing absorption of the floor of the orbit, destroying the soft parts within that cavity by exciting inflammation and suppuration, and lastly affecting the orbitary plate of the frontal bone.

Treatment. Though polypus of the antrum shows itself in the nose and in the orbit, it is not to be attacked in either of these directions. It is through the facial wall of the cavity that the tumour is to be reached. This is illustrated by the following case, which also serves to show the effects of the disease on the orbit:—

Case 80.—James Macculloch, aged 53, who became a patient under my care, at the Glasgow Eye Infirmary, in February 1828, stated that he had been sensible of a stuffing of the right nostril for some years; that six months before his admission he had been attacked with supra-orbital pain, darting towards the right side of his head; and in a short time after this, with pain in the region of the right maxillary sinus, stretching towards the floor of the orbit, and increased when he opened his mouth. This was soon followed by stillicidium lacrymarum; a soft elastic swelling, in the situation of the right lacrymal sac; and protrusion of the eyeball forwards, outwards, and upwards, from the orbit. He complained of a want of the sense of taste in the right side of his mouth. He slept little on account of the pain above the eye. On examining the palate, it was found to be yielding and elastic under the right maxillary sinus. For several weeks, the vision had been double, in consequence of the displacement of the right eye. The conjunctiva was inflamed, the eyelids adhered in the morning, and in consequence of the exposed state of the protruded eye, a small ulcer existed at the lower edge of the cornea. The right nostril was found to be filled by a polypous excrescence, of a white colour and medullary texture, which bled profusely on being touched.

After clearing away this substance with the polypus-forceps, a carious opening, sufficient to admit the end of the little finger, was found to exist between the nostril and the maxillary sinus. With the finger introduced through this opening, it was ascertained that the sinus was completely filled with the same kind of polypous excrescence which had occupied the nostril. The clearing of the nostril was performed on the 19th; and it is remarkable, that this had so much relieved the pressure on the orbit, that five days after, when I proceeded to open the maxillary sinus, the ulcer of the cornea was already cicatrized, evidently in consequence of the eyeball having retreated somewhat into the orbit, so as to allow it to be better defended by the lids.

On the 24th, I made an incision, oblique in its direction, from above downwards, and from without inwards, through the cheek, down to the bone, with the intention of opening the sinus and removing its contents. I found, however, that the polypus had already produced absorption of the outer wall of the sinus, to the extent of half an inch in diameter. Through this opening the polypus was broken down and extracted. It resembled brain in colour and consistence. The bony parietes of the sinus were felt throughout to be diseased; its nasal side much disorganized; the os unguis gone; the orbital side, and indeed the whole interior of the sinus, denuded of its lining membrane. A long dossil of lint was introduced into the sinus. In a few days, a profuse secretion of white fetid matter flowed from the whole of the internal surface of the sinus, on removing the dossil of lint.

By the 4th March, the nose and lacrymal region were much more natural in their appearance, and the eye more in its place. A solution of chloride of lime (℈i. to ℔ij. of water) was daily injected into the sinus, with the view of correcting the fetor of the discharge. The long dossil of the lint was carefully introduced, so as to fill the cavity completely. By the 9th, all pain had ceased, the eye was still more in its place, the vision improved, and the shape of the face much more natural. The discharge had lost its fetor, and was less in quantity. By the 18th, the double vision was gone. By the 27th April, there was very little discharge, and the vision was much improved. On the 5th August, the report runs thus: — General health and local symptoms go on improving — On pressing the site of the lacrymal sac, thick white matter issues from the lower punctum, but is diminishing under the use of an injection of the nitras argenti solution — Antrum seems contracting, and discharges very little — Water injected by the opening, flows out by the nostril.

On the whole, this case proved much more satisfactory than, from the very disorganized state of the sinus, I had expected. Vision and life were saved by the operation. More than six years after, the patient was in good health, the wound much contracted, the sinus still kept open with a bent wooden style, and no appearance of any reproduction of the polypus. In April, 1835, however, Macculloch presented himself at the Eye Infirmary, with similar symptoms on the left side, as had formerly attended the commencement of the disease of the right antrum. He was ordered to be received as an in-patient, but appears to have declined admission.

In the case which I have just now related, the bleeding was easily restrained; but in other instances profuse hæmorrhage has followed the cutting or tearing away of the tumour, so as to demand the application of the actual cautery. This means has also been employed for destroying the remains of the fungus, when it could not be completely extirpated.

The sinus might have been cleared, in Macculloch's case, without making any incision through the integuments, namely, by detaching the cheek from the upper maxillary bone; but in this way the discharge would of course have flowed into the mouth, which would have been very disagreeable to the patient, and he would have been exposed to foreign substances entering the sinus. When we are anxious about the personal appearance of the patient, we will perhaps prefer this mode of operating; but when that is less our object than a ready and effectual method of getting rid of the disease, the incision through the cheek will be adopted.

The method of operating followed by Desault, in fungus of the maxillary sinus, consisted, not merely in opening that cavity, after detaching the cheek from the bone, but in removing with the gouge and mallet, a considerable portion of the alveolar process.[23] I should regard this as in general unnecessary, and to be had recourse to only when this portion of the wall of the antrum is unsound, or gives origin to the morbid growth. Through the mouth, it may be somewhat difficult sufficiently to lay open the sinus; but by cutting through the cheek, the bone may be so completely exposed, and an opening made of such a size into the sinus, as shall readily permit the diseased mass to be removed. Since I first published these remarks in 1830, a still more formidable operation has been frequently performed for the cure of fungus of the maxillary sinus, as well as for other diseases of the upper maxilla, namely, total excision of the upper maxillary bone. An operation of such severity should be had recourse to, only where there is reason to conclude, first, that the disease is so confined to the maxillary and neighbouring bones, that it can be completely removed; and, secondly, that it cannot be destroyed by any other method. A fungus completely confined within the antrum may always, I apprehend, be extirpated, without sacrificing more than a portion of its parietes; it is not probable that a malignant tumour, originating within the antrum, but which has already thrown its ramifications into the nostril and the orbit, could be removed, even by the sacrifice of several of the other bones of the face besides the upper maxillary. Still more hopeless are fungous tumours originating in the ethmoid or sphenoid.[24]

The following case is worthy of consideration, not less on account of the great degree of disorganization produced by the disease, as for the simplicity of the method of cure: —

Case 81.—A man, aged 36, applied to Dr. Eble, on account of an ulcerated state of the left cheek, with protrusion and amaurosis of the eye of that side. The cheek was not merely inflamed, painful, and partly ulcerated; but the subjacent bone was exposed, softened, and perforated in five different points. The probe, introduced through these openings, was met by an elastic fleshy substance, which completely filled the antrum, and by pushing up the roof of this cavity had driven the eyeball forwards and outwards. The floor of the antrum was yet entire; but the alveolar process at one place, where formerly there had been a carious tooth, gave issue to a considerable quantity of fetid ichor. The eye was so much protruded, that it could not be covered by the lids; the amaurosis so far advanced that the patient could at a footstep's distance perceive very large objects but obscurely; the motions of the eye extremely difficult; severe nocturnal pain in the bottom of the orbit prevented sleep. The patient had always been healthy, except that for the last two years he had suffered from severe toothache, for which he had had three carious teeth extracted; and from ulcers of the gums. He had, moreover, experienced an increasing weakness of sight. At this period, the surgeons who attended him, opened twice a swelling over the second and third molares, and at each time a quantity of yellowish and slightly fetid pus was evacuated.

To limit the spread of the ulcerative inflammation of the cheek, Dr. Eble ordered eeches to the sound parts, and the diseased parts to be bathed with a lukewarm otion, and carefully cleaned. The swelling and pains diminished, and the ulcerated places became cleaner. The matter not escaping easily from the antrum in consequence of the smallness of the openings, he dilated these with sponge-tent, and then endeavoured to destroy the polypous mass, by means of nitrate of silver, which he applied daily through one or other opening, for the space of 10 minutes. In four weeks, there was a free space of 4 lines betwixt the edges of the openings and the polypus, so that he could now inject into the interval, twice daily, a saturated solution of nitrate of silver. This hastened very much the destruction of the polypus; for in 14 days the eyeball was perceptibly retracted, and its motions had become freer. The violent pains at the bottom of the orbit were at the same time mitigated; but vision was not improved, although the pupil was not so much dilated. In the 8th week of the treatment, Dr. Eble removed with the scissors the portion of bone between two of the openings, and in consequence of this was enabled to apply the caustic more freely, by which the complete destruction of the polypus was effected in the 12th week. It now appeared that the osseous walls of the antrum were nowhere carious, but only spongy, and that the floor of the orbit had suffered very little. As the polypus shrunk, all the symptoms of amaurosis were removed, and the eye returned into its natural situation; a good-conditioned suppuration took place in the whole parts affected; the obstinate growth of the mucous membrane stopped, and the spongy bone became firmer in its texture; healthy granulations sprung from all the openings; and these gradually contracted, until one after the other closed. In 4 months, the patient was perfectly cured.[25]

A remarkable instance of successful extirpation of a maxillary fungus occurred in the practice of Dr. Thomas White of Manchester. Indeed, the bones of the orbit appear to have suffered more in this case than in any other on record.

Case 82. — The patient was a female. In two years' time, the tumour, situated betwixt the left zygomatic process and the nose, put on a frightful appearance; having grown to such a bulk that it pressed the nostrils to one side, so as to stop the passage of air through them, and thrust the eye out of its orbit, so that it lay on the left temple. Though thus distorted, the eye still performed its office. The swelling occupied the greater part of the left side of the face, extending from the lower part of the upper jaw to the top of the forehead, and from the farthest part of the left temple to the external canthus of the eye. Upon handling the tumour, Dr. White found an unusual and unequal bony hardness. It was of a dusky livid colour, with varicose veins on the surface, and there was a soft tubercle projecting near the nose, where nature had endeavoured in vain to relieve herself.

Dr. White began the operation with a semi-circular incision below the dislocated eye, in order to preserve that organ and as much as possible of the orbicular muscle; then carrying the incision round the external and inferior part of the tumour, he ascended to the place where he began, taking care not to injure the left wing of the nose. After taking away the external part of the tumour, which was separated in the middle by an imperfect suppuration, there appeared a large quantity of a matter like rotten cheese, in part covered by a bony substance, so carious as to be easily broken through. Abundance of this matter was scooped away, with a great many fragments of rotten bones. Upon cleansing the wound with a sponge, Dr. White found the left bone of the nose, and the zygomatic process, carious, and removed them. He says there were no remains of the bones composing the orbit. The optic nerve was denuded as far as the dura mater; this membrane and the pulsation of the vessels of the brain were apparent to the eye and touch. The superior maxillary bone, in the sinus of which the disease had had its origin, was surprisingly distended, and in some places carious. The alveolar process was probably in this state, as Dr. White mentions that he removed it. He then applied the actual cautery to the rest of the bones, taking care not to injure the eye and neighbouring parts, which were sound.

The patient drew her breath through the wound, and was so incommoded by the fetid matter flowing into her throat, that she was obliged for several weeks to lie on her face, to prevent suffocation. Notwithstanding her miserable condition, nature at length assisted, laudable pus appeared, sound flesh was generated, and the patient recovered. The eye returned to its place, and she enjoyed the perfect sight of it. The only inconvenience that remained, was a constant discharge of mucus from the inner canthus of the eye.[26]

Mr. Howship has illustrated, by an engraving, the great extent to which the bones, forming the parietes of the antrum, may be dilated by this disease.

Case 83.—The patient, whose skull he has represented, a woman about 30 years of age, was received into the Westminster Hospital, with an extraordinary swelling upon the right side of the face, producing great distortion of countenance, but not attended with any discoloration of the skin. The basis of the tumour extended upwards to the eye, which was almost closed, and reached below to the chin; the adjacent angle of the mouth being much depressed, and thrown out of its line, and the nose pressed aside towards the left cheek. In the most prominent part, the tumour projected about 4 inches beyond the general line of the bones of the face. On the inside of the mouth, the tumour was very large, having extended itself across the palate, nearly to the opposite teeth. The tumour was confined entirely to the bones about the upper jaw; it was apparently fleshy, and where it extended across the roof of the mouth, it was of a florid red colour. The teeth of the upper jaw, thrown out of their natural situation, formed an angle with the remaining part of the alveolar circle. All those teeth involved in the extent of the tumour, were thus forced into the middle of the mouth, greatly impeding deglutition.

The disease was of 5 years' standing, and had begun with a small soft swelling in the right nostril. In this state, it had produced no uneasiness. On the presumption of its being a polypus, the tumour had been partially extracted at different times. These operations seemed only to accelerate the progress of the disease, aggravating the degree of uneasiness and pain the patient now suffered, and hastening the increase of the swelling. When the complaint had become more completely formed, there were two or three teeth which from their horizontal position were very much in the way, and troublesome from their being loose. Although the operation of removing them required no great effort, it was attended with such an hæmorrhage as brought the patient very low, before it could be effectually checked. A second violent bleeding took place about three weeks afterwards, from a spontaneous breach in the softer part of the tumour. This reduced her so much that she languished only a week longer.

On dissecting the tumour, it proved to be a fleshy mass, or excrescence, not contained merely within the antrum, but surrounding and enclosing all the bones of the upper jaw. These bones had, from pressure, suffered a separation at their respective points of union, with such a degree of extension and attenuation of their substance, that in many places they were reduced to the thinness of paper. The os malæ was detached from the rest of the bones, and (though in its natural state a very solid bone) exhibited a cribriform appearance.

The origin and nature of the disease cannot be a matter of any doubt. The bones had most likely remained uninjured till the soft fungous vascular mass from within the cavity of the antrum began to operate, first, by producing absorption of the membrane lining that cavity, and then by the pressure of its peculiar and partially organized texture, not exciting regular absorption of the bone, but sufficiently loosening its structure to admit of considerable distention. In the progress of the disease, as might naturally be expected, the circulation in the periosteum made some efforts towards repairing the mischief, by the secretion of new bone, as happens in cases of necrosis, although this effort, owing to the almost disorganized condition of that membrane, had proved irregular and abortive.[27]

The following case illustrates the cure by excision of the upper maxillary bone:—

Case 84.—Janet Steel, aged 42, admitted into the Royal Infirmary of Edinburgh, on the 20th November, 1834, stated that, about 10 years before, she had received a kick on the face from a cow, which was followed by swelling that never entirely disappeared. In the beginning of 1834, she began to suffer pain in the seat of enlargement, and at the same time remarked a great increase in the rapidity of the growth. The superior molar and bicuspid teeth of the affected side, soon afterwards loosened and came away. Within a few months of her admission, the progress of the disease had not been so rapid, but it had advanced so far as to be very distressing, and threatened to prove still more serious.

The cheek was considerably distended by a tumour springing from the superior maxilla, which, though firm, did not possess the hardness of bone. When the finger was drawn across the lower margin of the orbit, an inequality in its surface was detected, and the floor of the cavity could be felt distinctly elevated. The palate, throughout the whole of its extent on the left side, and also for some distance beyond the mesial plane, was greatly thickened, and extremely irregular on its surface, which exhibited the characters of a malignant ulcer. The patient in all other respects enjoyed good health, and it was, therefore, thought proper to attempt eradication of her formidable and extensive disease, which was evidently confined to the superior maxillary bone.

On the 28th, the patient being seated in a chair, a perpendicular incision was made, by Professor Syme, from the inner angle of the eye down through the lip, and another from the convexity of the malar bone to the angle of the mouth. The flap thus formed was dissected up, and the integuments on each side turned back so as to expose the whole surface of the maxillary bone. One blade of a pair of cutting pliers was then introduced into the nostril, and the other into the orbit, so as to divide the ascending nasal process. A notch was next made with a saw in the malar protuberance, which then readily yielded to the pliers. After this, only the palate and septum of the nose remained to be divided, which was done by first circumscribing the morbid surface in the roof of the mouth with a sharp-pointed straight bistoury, and then cutting through the bone with the pliers. The diseased mass was now easily turned out to the side, and detached from its connections, when it appeared that the tumour had been removed quite entire. It was of moderately firm consistence, and of a yellowish colour, springing from the maxillary bone and filling the antrum. By its pressure it had caused absorption, as well as displacement, of the floor of the orbit.

The arteries requiring ligature having been tied, the patient was conveyed to bed. An hour after the operation, the cut edges of the integuments were brought into accurate contact by the interrupted suture, except at the two points where the lip was divided, each of which was secured by the twisted suture, a sewing-needle being used for the purpose. Cloths moistened with cold water were diligently applied. The wounds healed by the first intention, and the patient was dismissed on the 20th December, with wonderfully little deformity.[28]

Fungus of the maxillary sinus occasionally proves fatal, not so much by the hæmorrhage which attends it, or the hectic fever it induces, as by the pressure it causes on the brain. "I have seen," says Bertrandi, "a polypous excrescence, so situated, that, inferiorly it destroyed the bones of the palate; it filled the mouth, and anteriorly consumed the maxillary bone; superiorly, it pushed the eye almost out of its socket; at length it destroyed the roof of the orbit, pressed upon the brain, and the patient died apoplectic."[29]

Case 85. — Janet Anderson, aged 44, applied at the Glasgow Eye Infirmary, on the 25th March, 1838. She stated that 9 weeks before that date, her left lower eyelid had assumed a dark red colour, as if affected with ecchymosis from a blow. For 12 months she had been much troubled with pain in the left side of her head, attended by a feeling of pressure and stoppage in the left nostril, which was deficient in moisture and sense of smell. She complained of numbness over the left side of her face, and the hearing of the left ear was impaired. Both left eyelids, as well as the conjunctiva, were œdematous at her admission; a symptom which generally attends cases of pressure on the orbit, from whatever quarter or cause the pressure arises. She stated that, since the swelling of the eyelids commenced, her head had been relieved. There were no symptoms of dacryocystitis. The vision and the power of moving the eye were natural. Tongue clean. Pulse 96. She was ordered to be bled at the arm, and to take two grains of calomel with half a grain of opium at bedtime.

June 13th, Has not attended since 25th March, and went away without being bled or getting the pills. Pain gone. Still considerable swelling between the upper eyelid and eyebrow, with fluctuation towards the inner angle of the eye. Skin of a dark red colour. Conjunctiva of lower eyelid red and swollen. The eye ball is somewhat displaced towards the side of the orbit. An incision being made through the upper eyelid into the swelling, some matter was discharged, and a considerable cavity was felt with the probe, extending to the periosteum of the orbit. A poultice was applied, and two aloes and blue pills ordered to be taken at bedtime.

15th, Complains of chilliness about 6 o'clock P.M., followed by a hot fit. A grain and a half of sulphate of quina were ordered thrice a day.

18th, Chilliness and feverishness diminished. The dose of sulphate of quina was increased to two grains.

24th, Feverishness gone. Sulphate of quina continued.

28th, A swelling projects from beneath the eyeball, of considerable size, and possessing an indistinct fluctuation. The discharge from the opening above the eyeball has become very trifling. She states that purulent matter is frequently discharged through the left nostril.

July 5th, Last night the swelling opened spontaneously, a little below the inner canthus, and discharged a considerable quantity of thick matter. A probe introduced by the opening, passes through the lower eyelid, nearly to the outer canthus, and also back into the orbit, to the depth of about an inch.

13th, Fluctuation being felt below the eyeball, an incision was made with a lancet to the depth of an inch, but no matter flowed.

23rd, She was ordered to omit the sulphate of quina, and to take two grains of calomel with half a grain of opium thrice a day.

Feeling her strength declining, she left the Infirmary on the 29th; and died on the morning of the 4th August.

The eyeball was found in a state of exophthalmos, and pressed towards the temple; the conjunctiva, in a thickened and fleshy state. The whole surface of the left hemisphere of the brain was covered with thick, green, and very fetid pus. At the forepart of the left anterior lobe there existed a very considerable depression of the cerebral substance, to the extent of about five-fourths of an inch in diameter, and the membranes covering this spot were much discoloured.

On raising the left anterior lobe from the orbitary process, purulent matter was seen to issue from the orbit, through an ulcerated spot of the dura mater, towards the nasal edge of the roof of the orbit, where there was a small carious perforation of the bone. This opening corresponded to the depression on the surface of the brain already mentioned. It seemed probable, that the matter, issuing from the orbit into the cavity of the cranium, had caused that depression, and that the matter had been confined there for a time, but, increasing in quantity, had spread itself over the surface of the brain, as already mentioned.

The orbit, besides containing a considerable quantity of pus, was filled behind and to the nasal side of the eyeball, with a tumour of a whitish yellow colour, and rather more than cheesy consistence, which, along with the collection of purulent matter, had pressed the eyeball forwards and towards the temple. The muscles were displaced in the same direction.

The tumour, which had the usual appearance of antral polypus, filled the antrum completely, the bony partition between this cavity and the orbit being destroyed. The posterior part of the nasal wall of the orbit, and the greater part of the ethmoid bone, were reduced to carious fragments, mixed with thick offensive pus.

This case was considered by my colleagues and myself as one of orbital abscess; but the dissection proved it to have been one of antral polypus, the orbital disease being merely secondary, as well as the inflammation of the brain, of which the patient died. The circumstances which led us to regard it as an orbital abscess, were the appearances of the eyelids, the discharge of pus when they were punctured, and the total absence of any enlargement of the cheek, or any external dilatation of the antrum. The only circumstance upon which, perhaps, we did not lay sufficient stress in forming our diagnosis was the state of the nostril.

Case 86. — In 1817, I had an opportunity of examining a skull in the possession of Professor Prochaska, which had suffered an extraordinary change in structure and form, from a tumour which, in all probability, originated in one of the antra. The patient was 18 years old when he died. During his apprenticeship to a shoemaker, he had been ill-used by his master, knocked down by blows on the head, and kicked by him while on the ground, in consequence of which he began to be affected with weakness of sight and prominence of the eyes. In 1786, he was brought to Prochaska, then at Prague. Both eyes were amaurotic, and protruding from the orbits, the bones both above the orbits and at the sides of the nose tumefied, and respiration through the nostrils obstructed. He continued in this state till 1791, without pain and almost without any other inconvenience than the amaurosis. Gradually, however, the eyes protruded more and more; the face above the orbits, at the root of the nose and throughout the whole upper jaw, became enlarged, as did also the palate, which began to project into the cavity of the mouth. Ichorous discharge followed from the nostrils, with frequent and profuse bleeding. For four weeks before his death, he was confined to bed from weakness, breathing not at all through the nostrils, and with difficulty through the mouth; his mind, however, not affected. On the morning of the 18th September, 1791, his mother found him insensible; and in the evening of that day, respiration through the mouth and nose being completely impeded, he died.

The head, examined externally, presented above the eyes two tumours into which the supra-orbitary arches had degenerated; while the root of the nose, and the upper jaw on each side, were so much swollen that no part of the nose but the point and pinnæ was visible.

On dissection, the right nostril at its anterior part was found greatly dilated, the cartilaginous septum being pushed to the left side; posteriorly, the osseous septum was destroyed, and both nostrils were converted into one ample cavity, filled by a tumour remarkable for its spongy excrescences, and which by its pressure had dilated and pushed down the palate. On opening the cranium, the anterior and middle lobes of the brain were found to be of an unnatural ash colour, and that portion which lies upon the cribriform plate of the ethmoid and orbitary processes of the frontal bone dissolved, along with the dura mater, into a pulp of the same colour, and in contact with the tumour proceeding from the nostrils. On account of the morbid condition of the brain, none of the nerves from the olfactory to the auditory could be distinguished. The internal part of the basis of the skull, from the orbitary processes of the frontal to the basilar process of the occipital bone, was tumefied and softened. After this examination was made, the head was submitted to maceration, which, being finished, there fell out from the basis of the cranium, and from the nostrils, a ponderous mass, partly like lard, partly cartilaginous, but not at all osseous, which, by means of its soft processes, had penetrated into the osseous swellings above the orbits, filling all the interstices of the radiating laminæ into which these swellings had degenerated, and emerging at these places under the common integuments.

The following was the state of the cranium:—The orbitary processes of the frontal bone, the ethmoid, the vomer, the turbinated bones, the little wings of the sphenoid, and its middle part (except the anterior clinoid processes, which adhered by osseous filaments to the remaining part of the sella Turcica), the anterior part of the basilar process of the occipital bone, and the apices of the petrous portions of the temporal bones, as far as the carotid canals, were so completely consumed, that the vast cavity of the nostrils, along with that of the mouth, opened into the cavity of the cranium. Forth from the cranium also, as well into the compressed and deformed orbits, as into the supra-orbitary swellings already described, there were many larger and smaller openings. The superior maxillary bones, with their nasal processes, and the proper bones of the nose, were much expanded, and so thinned away, that they presented various gaps, opening into the cavity of the nostrils. The palatine processes of the superior maxillary bones had disappeared; the pterygoid process of the sphenoid bone, on the right side, had so receded in its superior part, that the spheno-palatine foramen much enlarged, opened into

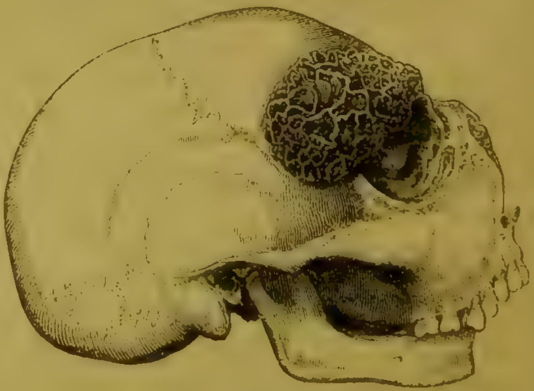

Fig. 7.

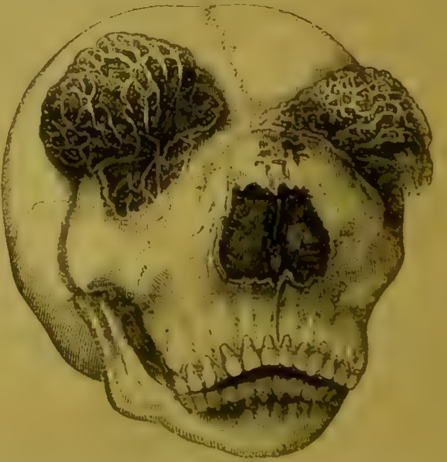

Fig. 8.

the zygomatic fossa. The left antrum Highmorianum had disappeared from compression, and the right opened backwards by a large hiatus.[30]

The fatal termination of fungus of the antrum, when left to itself, and the favourable result of extirpation of the tumour, or of excision of the upper maxillary bone, in many cases now recorded, should lead us at once to propose an operation, and not for a single day to leave the tumour to proceed in its slow but certain work of destruction. The advocates for excision of the bone speak very positively regarding the fruitlessness of any other mode of treatment. " The opening of the cavity, with an attempt to clear it of the soft pulpy mass," says Mr. Liston[31], " as formerly practised, is totally inadmissible; it is a piece of unmeaning and utterly useless cruelty. If any thing is to be done, it ought to be undertaken with a thorough determination to go beyond the limits of the morbid growth, to remove the cavity which holds it, and thus get quit, if possible, of all the tissues implicated, or which may have become disposed to assume a similar action." These opinions of Mr. Liston must appear far too sweeping and dogmatical to any one who attentively considers the cases on record, in which the plan of operating which he condemns, appears to have been completely successful.

Mr. Pattison[32] makes mention of two cases, in which tying the common carotid artery, without any other operation, was sufficient to cure this disease. In the hands of others, this measure has failed.[33]

3. *Aneurism by anastomosis affecting the upper maxillary bone.* In his Appendix to Burns on the Surgical Anatomy of the Head and Neck, Mr. Pattison has given some particulars of a case which he considered to be an aneurism by anastomosis of the maxillary sinus, and for which he tied the common carotid artery.

Case 87.—The disease had existed for many years; and under the notion of its being a polypus either of the nose or the antrum, attempts had been made to extirpate it. These were abandoned, however, on account of the hæmorrhage which they produced, and the patient afterwards continued to be troubled with violent bleedings from the tumour on the least exertion. The morbid growth had expanded the antrum, deformed the face, and protruded the eye, like other tumours in the same situation; but on pressing the diseased mass between two fingers, one introduced into the mouth and another placed externally, that peculiar pulsatory throbbing which characterizes anastomosing aneurism, was at once detected.

Immediately after tying the carotid artery, the appearance of the tumour, as it presented itself in the nostril, became remarkably changed. Just before, it seemed distended, almost to bursting; but as soon as the direct circulation into it was removed, its distension ceased, its surface became shrivelled, and its pulsatory movement could no longer be felt. The appearance of the countenance daily improved; the swelling subsided; the malar bone and zygoma, which had been completely buried in the tumour, as it was absorbed, again became evident; and two years and a half after the operation, the remaining deformity was so trifling as to be hardly perceptible.[34]

Case 88.— Mr. Liston had occasion to remove a tumour involving the left upper maxillary bone. Upon a careful examination, it was found to be composed entirely of erectile tissue, but it did not seem to have had its origin in the maxillary sinus, nor in the mucous tissue. It had, however, compressed and displaced the bone, and nearly caused obliteration of the antrum. It was a fortunate occurrence, Mr. L. remarks, that this tumour was cut out clean along with the bone, from which it was inseparable. Any wound of the tissue would have caused great embarrassment, in all probability, from hæmorrhage, and would have rendered the operation more difficult and dangerous.[35]

4. *Fibrous, osteo-fibrous, cartilaginous, or fibro-cartilaginous tumour of the upper maxillary bone.* Designated by these appellations, a class of non-malignant tumours has been described by Lizars, Gensoul, Liston, Solly, and others, as affecting the upper maxillary bone. They are said to be very firm, and altogether destitute of the resiliency presented by a cyst, and sometimes even by a fungus within the antrum; of a globular or botryoidal form; often homogeneous in structure, but sometimes cartilaginous externally, with spiculæ of bone internally, or containing a glairy albuminous substance. They often appear to originate in some external injury; commence in the osseous structure or in the periosteum; sometimes reach a very large size, but are extremely slow in their progress, and do not affect the constitution, except by the pressure they exercise on the surrounding parts. Tumours of a malignant kind are generally attended with headache, stuffing of the nostril, protrusion of the eye, and expansion of the upper part of the face; they advance by rapid strides, and speedily affect the general health. If such symptoms are absent, there is a probability that the case is one of the present class, and therefore more likely, if it does not yield to the use of iodine, to be benefitted by excision of the affected bone.

Case. 89.—For the purpose of ascertaining the nature of a tumour projecting from the front of the upper maxillary bone, Mr. Stanley pierced it with a grooved needle, from the inside of the mouth. The sensation attendant on the passage of the instrument through the tumour assured him that it was composed of cartilage, with particles of bone dispersed through it. An ointment, containing first iodide of potassium, afterwards iodine, was kept constantly applied to the cheek, and during its use the tumour slowly diminished. At the end of a week, about two-thirds of its bulk had disappeared.[36]

Case 90.—The same author has figured the face of a boy, 14 years of age, enlarged and distorted by a compound growth, which originated in the upper maxilla, filled the cavities of the nose and orbits, and extended into the cavity of the cranium. The growth was composed of two distinct substances. The portion of it which filled the nostrils consisted of a soft, very vascular tissue; whilst the portion of it occupying the deeper cavities of the nose and the orbits, and extending into the cavity of the cranium, consisted of cartilaginous substance mixed with bone. The disease had been of very slow growth. Both eyes were protruded from the orbits. In one orbit the optic nerve had disappeared, and in the other the nerve was considerably elongated. The portion of the tumour which projected into the cavity of the cranium was imbedded in the anterior lobes of the cerebrum.[37]

The mode in which excision of the upper maxillary bone was at one time generally performed, may be gathered from Case 84. The incisions through the cheek have since been simplified by Dieffenbach and O'Shaughnessy; and the bone has actually been excised by Horner within the mouth, and without any incision through the cheek. The object of these changes has been to avoid the deforming cicatrices which necessarily ensue, when incisions of the soft parts are carried through the lip, and the palsy of the muscles, which follows division of the branches of the facial nerve. In some cases, the alveolar process and the bony palate may be saved; in others, these parts require to be removed. The same remark applies to the floor of the orbit. The separation of the bony attachments is accomplished chiefly by the cutting pliers.

For a history of the operation, and minute accounts of the manner of performing it, the reader may consult the works mentioned in the note.[38] Of course, no operation of the kind should be attempted, unless there is good ground to believe that the necessary incisions can be made through healthy parts, beyond the limits of the disease. Although certainly one of the severest operations which the surgeon is called upon to perform, and the painfulness of which it appears dangerous to attempt to deaden by the use of chloroform, the recovery is often prompt beyond expectation. The supervention of erysipelas is the thing most to be dreaded.

5. *Exostosis of the maxillary sinus.* Osseous tumours springing from the walls or cavity of the antrum, have not unfrequently been known to disfigure, or even to obliterate, the orbit. To distinguish such cases from the diseases of the antrum already considered, will require very great attention. A maxillary exostosis sometimes reaches a great size; but to whatever size it may grow, its most prominent point never softens, which constitutes an important diagnostic mark, by which it may be distinguished from abscess, and from polypus. The following cases will serve to show that the nature of such growths is by no means uniform. They are apt to be combined with hyperostosis of the other bones of the same, or even of the opposite, side of the face.

Case 91. — *Maxillary exostosis cured by mercury.* Boyer relates the case of a man, who for more than 10 years had an exostosis of the left maxillary sinus. The eye on that side was affected with stillicidium lacrymarum. The eyeball was pushed forward, the nose twisted to the right, the nostril closed, and the palate somewhat swollen. The tumour was very prominent upwards and outwards, and the skin covering it red and shining. The visage was excessively deformed. The exostosis had appeared soon after a venereal infection, which had been followed by secondary symptoms. It had increased slowly; but for several years had made no progress. Painful at first, it had ceased to be so when it became stationary. The patient, of his own accord, resolved to try fully the effect of the liquor of Van Swieten; and after having taken, without any medical advice, and in less than three months, 128 grains of corrosive sublimate, he was entirely freed of the exostosis. The eye returned into the orbit, the stillicidium ceased, and the nostril became free. A depression on the cheek, and an adhesion of the skin, marked what had been the situation of the tumour.[39]

Case 92.—*Orbit obliterated by a maxillary exostosis.* I recollect noticing a very remarkable skull, in the museum of the *Ecole de Médecine* at Paris, to which collection it was presented by Professor Sue. It has been described[40] as an example of osteo-sarcoma, but I think there can be scarcely any doubt of its being an exostosis of the walls of the maxillary sinus. The osseous tumour, which is actually not much less than an ordinary cranium, is smooth and polished externally, very thin at its upper part, hard and covered with bosses posteriorly, and interiorly filled with osseous cysts. It springs from the right maxillary sinus and lower part of the frontal bone, and extends from the right mastoid process towards the left maxillary bone. No trace is to be seen of the right orbit; the right nostril is entirely obliterated; as well as a portion of the left orbit. The tumour proceeds downwards and forwards from its origin, to a level with the basis of the lower jaw, measuring from the mastoid process 12 inches in length, and in circumference 16 inches.

Case 93. — *Maxillary exostosis passing through the orbit into the cavity of the cranium.* In the collection at St. Thomas's Hospital, London, there is the skull of a fish-woman, who had long been remarkable, even at Billingsgate, for her hideous appearance. Two large swellings had been formed under the orbits in the forepart of the cheeks, between which the nose appeared wedged, and the nostrils were closed. Each eye projected considerably from its socket. This person was seized with a fit, which seemed to be of an apoplectic nature, and in that state was brought to St. Thomas's Hospital, where she died almost immediately. Upon examination of the head, an exostosis was found growing from each antrum, and forming the large swellings upon the cheeks. The exostoses projected also into the orbits, so as to occasion the protrusion of the eyes. On the left side, the exostosis entered the cranium, projecting inwards through the orbitary process of the os frontis, and occasioning such pressure on the brain, as, under a considerable excitement of the vessels of that organ, produced apoplexy, which proved fatal.[41]

Case 94.—*Maxillary exostosis removed by operation — Disease returns.* An Irish labourer, aged 24, admitted into Guy's Hospital, 1st August 1835, stated that when 15 years of age, he perceived a small tumour in the right nostril, which had since that period gradually increased. At his admission, the tumour occupied the whole right side of the face. The right nostril was enormously expanded, and was filled up by the growth, which was so large as completely to conceal the eye on that side. The tumour extended downwards into the mouth, being there connected with the palatine and alveolar processes of the right superior maxillary bone, and projected forwards so as to press the lip beyond the teeth, to the extent of two inches.

The surface of the tumour was irregular. Its most prominent parts were situated under the right orbit and opposite to the ala nasi. They were slightly discoloured by inflammation; but the reddened surface of those projections indicated no approach whatever to the change in the vascular system, which evinces the existence of malignant disease. The patient complained of no pain; nor had he suffered much during the course of the disease. His general health appeared good; but he was greatly emaciated, more from want of food than from the constitutional effects of his disorder.

Mr. Morgan found the tumour almost uniformly firm, and of a bony hardness, even at its most prominent point. He was therefore led to conclude that it consisted of a morbid deposit of bone. He knew of no cases of malignant disease of bones, where the enlargement had proceeded to the same extent, and the disease existed for so long a time, the shell of the excrescence retaining the character of bone. There was no softening of the prominent point of the tumour in this case; and he therefore concluded that it was one of common exostosis.

Desirous of being certain of the nature of the disease, he made a crucial incision between the most prominent points, over the right nostril, and, by means of a trephine, removed a portion of the tumour, which proved to be true exostosis. A semilunar incision was then made, extending over the nostril, from the internal angle of the right eye to the centre of the upper lip. A similar incision was made on the outer side, commencing at the external angle of the eye, and joining the former at the lip. The integuments were then dissected from around the tumour, and with a metacarpal saw it was removed. As it was of a spongy texture, it offered little resistance to that instrument. No great quantity of blood was lost during the operation, the exostosis not being very vascular. The integuments were brought together by the uninterrupted suture.

A section of the tumour proved that it was composed of an outer hard thin shell of bone, enclosing a mass of spongy cancellated structure, devoid of all appearance of carcinomatous or fungoid disease.

The wound suppurated. The tumour in the mouth gradually decreased. Hardly any exfoliation took place. The patient's general health was speedily restored.[42]

The disease in this case returned. The patient died at Birmingham, in spring 1842, nearly seven years after the operation, so that his life may fairly be said to have been prolonged by it for nearly that period. A figure is given in Guy's Hospital Reports, Vol. vii. p. 491, London 1842, representing a cast of his head, taken after his death, and showing a tumour of enormous size.

Case 95.— *Exostosis of the maxillary sinus not discovered till after extirpation of the protruded eyeball.* Mrs. Craig, aged 24, was admitted into the Glasgow Royal Infirmary, 5th January 1828; at which time the right eyeball was so much protruded as to be almost out of the orbit. As I had occasion to see this patient before she went to the Royal Infirmary, I may mention that the protrusion was directly forwards, so that, though the idea of the exophthalmos propably depending on exostosis of the orbit naturally occurred to my mind, I could not have been led to assign any one of the sides of that cavity as more likely than another to be the seat of such a growth. Ectropium and chemosis attended the protrusion. The cornea was ulcerated and muddy, the pupil dilated and immovable, and vision lost. The patient had constant severe pain in the bones of the orbit and right side of the head, rendered more acute by pressure. She had rheumatic pain of the knees. Her health was greatly impaired, but had improved since she gave birth to a child, 8 weeks before her admission. The vision of the eye had been dim for 18 months, and completely lost for four. The pain of the head was of 12 months' standing, and the prominence of the eye of 8 weeks'. She had had some discharge of yellow fluid from the right ear, about the time when the sight was lost, but not afterwards. Her mouth was affected by pills, which she had taken for five or six weeks.

Dr. Anderson, under whose care she came on her admission into the Infirmary, suspected syphilis; but she denied it; and as the mercury seemed to have had little other effect than that of increasing debility, he suspended its use, and endeavoured to procure relief from other medicines and external applications, chiefly opiates and narcotics. These did not succeed. He then evacuated the humours of the eye, but this also was ineffectual. He next extirpated the eye; after which, a tumour about the size of a hazel-nut was discovered on the floor of the orbit, solid, nodulated, and bony. The pressure of this exostosis had been the cause of the pain and protrusion; but as it was firmly fixed, and not likely to exert any injurious pressure, it was not considered prudent to attempt its removal. From some inflammation and fulness in the right nostril, Dr. Anderson had been led to suppose it likely that there might be a fungous or other tumour pushing upwards from the antrum to the orbit. The relief from pain was remarkable after the extirpation of the eye. Plummer's pill, and a decoction of sarsaparilla, were now used for several weeks, during which time the patient got almost quite well; but whether this proceeded from the removal of the eye, the discharge which succeeded it, or the medicine, Dr. Anderson does not decide. He believes that all of these were useful. It was his intention to advise the insertion of a pea issue in the neck, and a continuance of the medicine; but the patient left the Infirmary on the 1st of March, without receiving these instructions. At that time her health was good, and there was no appearance of increased growth in the orbit.[43]

Case 96. — *Exostosis of each upper maxillary bone.* A stout healthy-looking man, 57 years of age, dated the origin of his complaint at a period 14 years before Mr. Howship saw him, which was in 1811. He was in perfect health; and on a windy day was walking up Hampstead Hill, when he was suddenly attacked with a violent itching and heat in both his eyes, which induced him to rub them vehemently. Before he could reach home, the irritation had increased to that degree, that he was unable to open his eyes in the light. Inflammation supervened, and a small tumour formed just below the inner angle of each eye, about the size of a hazel-nut. These swellings burst inwardly, discharging afterwards freely between the eyelids. The inflammation, treated by fomentations with poppy heads and other occasional remedies, went on for about 12 weeks. It had then so far subsided, that he could open his eyes and bear the light tolerably well, so that he went to work again.

About a fortnight after this, having been exposed all night to cold and rain in the winter season, he had a fresh attack. He applied to Mr. Ware, who ordered a warm poultice over each eye, as the swellings were again returning on each side of the upper part of the nose. This treatment was continued for about six weeks, when the abscess at the angle of the right eye burst, evacuating its contents upon the cheek. Two weeks afterwards, that upon the left side broke and a copious discharge followed. The formation of these abscesses, particularly that upon the left side, was attended with pains in the head, the severity of which he could compare to nothing but the sensation of his head splitting asunder. These pains spread also through the bones of his face. During this attack, he could get no rest day or night for the space of three months. A considerable degree of projection or tumour, apparently osseous, was now observable below the inferior margin of each orbit, and the eyes had become much more prominent than natural. He was at this time a patient in St. Bartholomew's Hospital, where his case excited much attention.

One day, one of the pupils observing the right eye to be protruded from the orbit, proceeded to examine it rather hastily, when, as he pressed the tumour and pushed back at the same time the eyelid, the globe of the eye suddenly sprung out beyond the palpebræ. With some difficulty it was reduced again. At this time he had some power of perceiving light with the right, but more with the left eye. The pains in his head and face continued so severe, that he was frequently almost distracted. The inflammation of the eyes was still violent, particularly that of the left. He was often delirious, and it was sometimes with difficulty he was prevented from tearing his eyes out, in the rage of pain and delirium. At length the right eye burst, from the intensity of the inflammation. The contents of the eyeball having escaped, the excessive inflammation declined, and the patient became somewhat better. The osseous tumours, however, still continued to grow, although their increase was very slow. Although nothing seemed either to have arrested their progress, or much relieved his complaint, he now found his general health much improved.

Some time after this, he was putting down a turn-up bed; and not being able to see what he was about, the bedstead slipped from his hand and fell, one of the feet striking him with great force immediately upon the ball of the eye that was protruded and lying upon the hard tumour in the cheek. By this accident the globe of the left eye was burst; but he suffered no particular pain at the moment, beyond the mere confusion arising from so severe a blow upon the face. A good deal of inflammation, however, soon came on, but subsided again spontaneously.

Subsequently to this period he usually enjoyed very good health, and in 1815 remained well. He merely observed that whenever he took cold, it was particularly apt to affect his head with a transient return of his old inflammatory pains. On separating the palpebræ, the conjunctivæ still retained strong marks of the severe inflammation they had long suffered. The tumours of the maxillary bones, feeling as hard as ivory, and not in the least painful when pressed, appeared to occupy very nearly the whole space of each orbit, as well as the cavities of the nostrils, which were almost, if not entirely, obliterated. In the integuments covering the tumours, were several enlarged and varicose veins. From the slow and uniform growth of the swellings, and from the great pain that attended their production, as well as from other circumstances connected with the history, Mr. Howship considers that there is every reason to believe that the original affection was the means of exciting a copious secretion of osseous matter, of a more dense texture than is natural to the parts; a change, he observes, which generally results from healthy ossific inflammation.[44]

I understand, that part of the skull of this patient is preserved in the Museum of the Royal College of Surgeons of England; and from the recollection I have of the preparation, it is it, I think, which is represented by Mr. Haynes Walton, at page 347, of his Operative Ophthalmic Surgery. He describes the osseous tumours as completely filling both orbits, the cavities of the nose, and probably the antra; extending as far back as the pterygoid plates of the sphenoid bone, and projecting more than three inches in front of the face.

Exostosis of the maxillary sinus is plainly one of the cases in which extirpation of the upper maxillary bone might be required.

§ 5. *Pressure on the Orbit from the Sphenoid Sinus.*

The sphenoid sinuses are each, when fully developed, of size sufficient to admit the end of the little finger. They are very variable, however, in size; and are large or small, according as the other nasal sinuses are more or less expanded. They lie before and beneath the sella Turcica, below and to the inner side of the foramen opticum, and to the inner side of the spheno-orbital fissure. The partition which separates the one sinus from the other, rarely runs in the middle plane of the body. They communicate with the upper meatus of each nostril; and, like the other sinuses of the face, are lined by a continuation of the Schneiderian membrane. From analogy, then, we may infer that they are subject to the same diseases as the frontal and maxillary sinuses.

I know of no instance on record in which the sphenoid sinuses were dilated by suppuration. In a case recorded by Dr. Bright, in which a fungous growth is mentioned as having occupied this situation, the appearances are but loosely described. The chief symptom during life was tic douloureux in the corresponding side of the face.[45] Sir Robert Carswell has figured a medullary tumour projecting into the cavity of the cranium from the cells of the sphenoid bone.[46]

The consequences of dilatation of the sphenoid sinuses on the orbit, and on the vessels and nerves entering that cavity, must be a matter of conjecture. Expansion of the sinuses could not take place easily, either downwards or backwards; and were their walls to be pressed either upwards or outwards, we should presume that they would deform the posterior part of the orbit, impede the circulation of blood to and from the eye, and destroy its sensitive power and motion.

In a case in which I was consulted, of severe neuralgia of the face, which resisted all remedies, and was attended with palsy of the muscles of the eye, ulcer of the cornea, and amaurosis, the uvula was dragged completely to one side of the fauces, while on the opposite side, and behind the velum, there was a firm tumour, which I conjectured might arise from a dilatation of one of the sphenoid sinuses. It also occurred to me that, were this conjecture just, the cavity of the distended sinus might, in such a case, be artificially opened, and its contents evacuated, through the mouth.

Mr. Hewett has recorded[47] a case, in which he extirpated the upper maxillary bone on account of a fibrous tumour, which, after the bone was removed, was found really to lie behind it. The tumour occupied various regions of the side of the face, adhered to the pterygoid processes, had insinuated itself under the temporal muscle, and into the orbit by the spheno-maxillary fissure, had nearly obliterated the antrum, the posterior wall of this sinus having been forced by it against the anterior one, while the origin of the disease was in the sphenoid sinus and roof of the nostril. The patient died from the intrusion of blood into the bronchia, while under the influence of chloroform during the operation.

§ 6. *Pressure on the Orbit from the Cavity of the Cranium.*

Although congenital malformations do not exactly fall within the scope of the present work, I may just mention that the bones of the orbit are in some rare instances defective from birth, so as to permit an encephalocele, or protrusion of the brain, to exist through them. In a case, related by Mr. Lyon[48], an encephalocele was situated at each inner canthus, and looked somewhat like a greatly dilated lacrymal sac on each side of the nose. Such cases are not to be meddled with; they may of themselves subside, shrink, and disappear; punctured, they will prove fatal.

In some diseased states of the encephalon, the orbits are pressed forward; their roof becomes nearly vertical, forming a posterior wall to the cavity; and their apex approaching their base, they become much shallower than natural, and the eyeballs protuberant. This takes place in chronic hydrocephalus. It is remarkably the case in the hydrocephalic skull, figured by Dr. Baillie,[49] and which is preserved in the Hunterian Museum at Glasgow. I have now before me the skull of an adult, so much dilated by a diseased state of the brain, that the distance from the external meatus auditorius to the crown of the head, which commonly measures 6 inches, amounts to 7½ inches; while almost every part of its parietes is so much thinned in consequence of pressure, as to be diaphanous. The ordinary depth of the orbit is $1\frac{7}{10}$ inch; whereas in this skull it strikes one at the first glance as unnaturally shallow, and on measurement is found only $1\frac{1}{10}$ inch in depth.

In another set of cases, one or other orbit, rarely both at once, although often the one and then the other, are not merely deformed by the pressure arising from disease within the cranium; but some part of their walls, and especially their roof, becomes involved by the disease of the brain or of its membranes, is partially absorbed, or inflames and is destroyed by caries or necrosis. Under such circumstances, death is generally preceded by amaurosis and exophthalmos.

Many cases might be quoted of diseased dura mater producing the destruction of the orbit by pressure and absorption. Most of the cases of this kind on record appear to have succeeded injuries of the head, by blows or falls. In some of them the dura mater was diseased, without any remarkable morbid change of the brain; in others, the brain was likewise affected. In some, the disease of the dura mater was fungous; in others, hydatiginous or encysted.

Mr. Hawkins cautions us against mistaking fungus hæmatodes in the diploe of the skull for fungous tumour of the dura mater. He says the disease of the bone spreads to the tables, and hence to the periosteum and dura mater, adhering to the sound dura mater and looking or if it arose from it. A similar view was entertained on the subject by the Wenzels. The disease, whatever be its origin, sometimes attacks several parts of the cranium at once, and is attended, I believe, with a pulsatory feeling in the tumour, synchronous with the movements of the brain. The cases related by Louis sufficiently show the danger of meddling with such tumours, death occurring in a few days, or even a few hours, after an injudicious puncture, or other operation.[50]

Disease originating in the pia mater or in the brain, and destroying the orbit, must necessarily be rare; but the case already quoted (page 52) from Mr. Hunter, shows the possibility of such an event.

The following cases illustrate the effects which the orbit and its contents may suffer from diseases originating within the cranium: —

Case 97.—A man, 51 years of age, fell from his horse and received a severe contusion on the head. Four years afterwards, his memory began to fail; from day to day this defect increased, till he could no longer recollect what he had uttered a moment before. Frequent and violent epileptic fits succeeded, but appeared to yield to different remedies, employed during six months. Severe and uninterrupted headache next supervened. No remedy was found to calm this symptom; and after six months, the patient died. For six weeks before his death, the left eye had been turned from its natural position in the orbit. On that side of the head, the pain had been comparatively slight.

On dissection, a considerable portion of the two tables of the middle anterior part of the right parietal bone was found carious; while various other places to a smaller extent were similarly affected. A fungous tumour adherent to the dura mater, had produced the absorption of the roof of the left orbit, and thus made its way into that cavity. The same tumour had destroyed the cribriform plate of the ethmoid bone; and the corresponding portion of brain was also diseased.[51]

Had the patient survived for any considerable time longer, there can be no doubt that the existence of this fungous tumour pressing through the orbit, would have been manifested still more distinctly, by external changes.

Case 98.—Maréchal had under his care a young man, 20 years of age, whose left eye was prominent and turned outwards, in consequence, apparently, of a tumour at the inner angle of the eye, attended by headache, giddiness, watering of the eye, and dryness of the nostril. Maréchal attacked the tumour with caustic, and then punctured the eschar, when there flowed out two or three table spoonfuls of lymph, a little reddish in colour; after which the eye was restored almost to its natural place.

On being appointed surgeon to Louis XIV., Maréchal handed the patient over to Petit. When the eschar separated, something like a vesicle presented itself in the middle of the opening. On puncturing this vesicle with the lancet, a fluid escaped, similar to what had previously been discharged, only less in quantity. Two days after, a third was opened in the same way, but discharged very little. The eye again became displaced outwards and forwards, as it had been at the first; the head became heavy, fever supervened, and in a short time the patient died lethargic.

On opening the head nothing remarkable was found in the brain; the dura mater investing the lower part of the middle lobe of the cerebrum appeared considerably elevated; and on endeavouring to detach it from the squamous portion of the temporal, it was found united to the bone, and the bone changed into a cartilaginous or fleshy substance. The roof of the orbit was changed in like manner; while three hydatids or vesicles, full of reddish fluid, and each about the size of a walnut, were found, one in the orbit; a second, half in the orbit, half in the cranium; and the third, in the hollow formed by the union of the sphenoid with the petrous and squamous portions of the temporal bone. That hollow, as well as the sphenoid bone, where it forms the optic foramen, was also softened. In fact this altered state of bone extended from the petrous portion of the temporal to the inner angle of the eye; the os planum and the os unguis being likewise affected.[52]

Case 99.—A lighterman, stout and healthy, aged 29, after frequent bleedings from the right nostril, and an obstructed and snuffling respiration, was attacked with severe pain over the whole front of the head, accompanied by a sense of weight in that part, and extreme lethargy. Although naturally of an active cheerful disposition, he became morose, indolent, and fond of solitude; at intervals he was attacked with tremors, cold perspirations, and syncope. These symptoms had become established, when the right eye began to protrude from its socket; his pain was at this time more severe, and a copious glairy discharge was set up from the nostril. As the disease advanced, his manner to his relations became strange, his intellect confused, and gait unsteady. The protrusion increased for several weeks. The pain did not abate, except for a few hours after occasional bloodletting. Convulsions at length ensued and terminated his existence, about three months after the commencement of the exophthalmos.

It is remarkable that he retained the vision of the affected eye up to the period of its protrusion; and before that symptom became obvious, he described the sensation of something pushing the eye out of its socket. During the whole period of his disease, although his bowels were extremely torpid, he had a good appetite, and little, if any, febrile irritation. These particulars Mr. Travers learned from the surgeon and relatives of the patient, having himself seen him only a few days before his death.

On dissection, the following appearances were observed:—Behind the right orbit lay a tumour, which had the appearance of an oblong polypous cyst; and anterior to this, and distinct from it, was a blood-coloured fungus, filling the orbit, and extruding the eyeball. The cyst lay anterior to the dura mater, adhering to its surface, and so situated as to make the right hemisphere of the cerebrum appear as if deprived of its anterior lobe. The ethmoid bone, frontal sinus, and orbitary plate of the os frontis, on the same side, were in a state of caries, so that the finger passed readily from the orbit into the cavity of the cranium and posterior nares. A large quantity of yellow viscid matter occupied the frontal sinus, such as had been discharged during life by the nostril. The os frontis in front of the sinus, and above the orbit, was denuded, and presented numerous small ulcerations. The anterior lobe of the brain was discoloured and softened; there was a quantity of water in the left ventricle, and some fluid blood in the right. On making a transverse section of the right hemisphere of the brain, it was found broken down in its texture, and the dura mater partially absorbed at its basis, the tumour having opened into the ventricle. The right thalamus was much diminished in bulk, though entire. The hæmatoid fungus in the orbit was mingled with spiculæ of bone. The dura mater, to which the cyst adhered, was continuous behind the cyst, except at the lower part where it was destroyed. The disease appeared, therefore, to be connected with the external surface of the dura mater, and by its increase, to have occasioned absorption of the bones, and displacement of the eye, and ultimately to have ulcerated through the dura mater and anterior cerebral lobe, and discharged itself into the right ventricle. The eye and its muscles were sound; as were also the optic and other nerves of the orbit. The olfactory nerve had disappeared, along with the ethmoid bone, on the right side.[53]

Case 100.—A robust man, aged 48 years, whose employment led him to the frequent lifting of heavy loads, was in the act of lowering from his cart a package of above 500 lb. weight, when his foot slipping, he was struck by the package on the head. No bad effects appeared immediately to result, so that he not only carried the load away to its destination, after placing it on his head, but continued for five weeks to pursue his ordinary occupation. After that period he began to complain of feelings of internal, obtuse, pressing pain in that part of the head where the right parietal bone, along with the frontal, forms the coronal suture; and the pulse became quick, full, and hard. To these symptoms there followed epileptic fits, which were renewed several times in the course of the day. The fever and pain of the head became mitigated, digestion and nutrition were unimpeded, but the patient continued for more than a year totally unfit for any employment, on account of the frequency of the epileptic attacks.

About 15 months after the accident, the pain of the head again increased to such a degree, as to deprive him of rest both night and day, and to cause such suffering that he could not help crying out. Violent fever and delirium accompanied the pain. These symptoms continued for several weeks, but the epilepsy ceased. The pain gradually descended to the right ear and eye; and in proportion as it became more severe in the orbit, it subsided in the upper part of the head. The eyeball became inflamed and swollen, and was protruded from the orbit. On raising the upper eyelid, the cornea was seen to be turbid, the pupil expanded and immovable, the iris green, and vision very imperfect. Onyx followed, commencing at the lower edge of the cornea, and advancing till the whole cornea was affected. Violent pain continued, proceeding from the bottom of the orbit towards the external parts of the eye, and attended at length by a discharge of blood from the inner canthus and right nostril. After this, the pain ceased, and the patient had only two fits of epilepsy. The left eye, with the exception of a little redness at the inner canthus, was healthy. Memory failed, and the vital functions became enfeebled.

About 18 months after the accident, the epileptic fits returned, they were more frequent and more violent than before, and some few short lucid intervals excepted, they were attended with constant stupor and absence of mind. Respiration became impeded, and the patient died in violent convulsions.

On sawing through the cranium, the bones of the right side were seen to be bent outwards, they were harder than those of the left, their two tables thicker, and their diploe wanting. The vessels of the dura mater were dilated, and filled with blood. The membrane firmly adhered at every point to the inner surface of the skull, except over the roof of the orbit, where a considerable portion of it was separated from the bone, thickened, and in a state of suppuration. The dura mater, tunica arachnoidea, and pia mater, were at that spot united together and firmly adherent to the brain. The corresponding part of the roof of the orbit was rough. The substance of the right hemisphere of the brain was softer than that of the left, and of a dirty brownish-white colour; the right lateral ventricle was enlarged and filled with thin fluid; the lower surface of the right anterior and middle lobes was occupied by a number of steatomata, from the size of a pea to that of a filbert, and corresponding to the destroyed portion of the dura mater, and the rough part of the roof of the orbit. The Gasserian ganglion, and its three branches, were surrounded by a firm cartilaginous mass; the motor oculi was compressed and changed in colour. Within the cranium, the abducens was contracted to the size of a small thread; but both it and the motor oculi were of their ordinary thickness, within the orbit. The internal surface of the right side of the cranium upwards to the middle of the frontal bone, and backwards over the little and great wings of the sphenoid to the sella Turcica, was rough. The cartilaginous mass surrounding the Gasserian ganglion was found to proceed through the spheno-orbital fissure into the orbit, surrounding the optic nerve and so filling up the space between the superior, external, and inferior straight muscles, as to envelope their origin and vessels, the posterior part of the nasociliary nerve, the inferior branch of the motor oculi, the abducens nerve, and the ophthalmic ganglion. The same cartilaginous substance was traced through the spheno-maxillary fissure, into the zygomatic fossa.[54]

Case 101.—In June, 1838, I lost a patient, in my private practice, from fungus of the dura mater. His age, when he died, was 69.

He first consulted me about ten years before his death, on account of stuffing in the nostrils, loss of sense of smell, deafness, and gradually increasing amaurosis. These symptoms occurred in the order in which I have mentioned them. The amaurotic affection ended in total blindness in 1830; and about a year after that, his eyes were observed to protrude considerably from their sockets. This symptom went on increasing, and the right temple became dilated, and elevated, by some cause residing within the orbit. The swelling in the temple was very painful to the touch, or when he had the part shaved. For a long time he suffered severely from headache, the pain commencing after the loss of sight, and about the time when the exophthalmos was first observed. About 18 months before death, the right eyeball was so much protruded that it burst, and was destroyed. About three years before death, he was attacked frequently, during six or eight months, with profuse epistaxis. At last he died dropsical.

At one period of his life, this patient snuffed a great deal; but he dropped that, and had recourse to smoking and chewing. He knew no cause of his disease; he could trace it to no fall or blow on the head. Indeed, previously to the stuffing of his nostrils, which was the first symptom, he had always been healthy, except that he was occasionally troubled with tremors, or rigors, for a few days at a time. He was not liable to headache before his sense of smell began to fail. He never had any fits, faintings, or paralytic symptoms.

The pain of his head was greatly relieved by the internal use of laudanum. From the state of complete deafness and blindness in which he was for some years before his death, it was difficult to know how far his memory or judgment was affected.

On inspection, the brain was found to be in no respect materially diseased. The pituitary gland was sound, and the cerebral surface of the dura mater was entire. Under the dura mater, between it and the basis of the skull, and especially behind the sella Turcica, there was an extensive fungous tumour, of a dark-red colour, soft and brainy in consistence. This tumour originated, or seemed to originate, from the cranial surface of the dura mater. It spread across to each temporal bone, which was in a state of caries. It dipped into the nostrils and filled both orbits, their roof and posterior parts being removed by absorption, as was also the cribriform plate of the ethmoid bone, and the outer wall of the right orbit. The tumour, where it filled the right orbit and protruded into the temple, was unlike the rest, being firm and whitish, like cartilage. This portion could not be distinctly separated from the rest of the diseased mass; but it seemed probable, that this portion was the lacrymal gland, enlarged and changed in structure. The optic nerves, between their chiasma and the orbits, were pale, and flat like ribbons.[55]

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[1] Medical Transactions; Vol. ii. p. 353; London, 1772.

[2] Hunter on the Blood, Inflammation, and Gunshot Wounds; Vol. ii. p. 307; London, 1812.

[3] Ibid. p. 287.

[4] Stanley on Diseases of the Bones, p. 150.; London, 1849.

[5] Guy's Hospital Reports; Vol. i. p. 493; London, 1836.

[6] See a case by Vater, Philosophical Transactions; Vol. xxxiii. p. 147; London, 1726.

[7] Runge de Morbis Sinuum Ossis Frontis et Maxillæ Superioris; in Haller's Disputationes Chirurgicæ; Tom. i. p. 212; Lausannæ, 1755.

[8] Novi Commentarii Societatis Regiæ Gottingensis; Tom. iii. p. 85; Gottingæ, 1737.

[9] See a case by Tott, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xi. p. 662; Berlin, 1828.

[10] Lehre von den Augenkrankheiten; Vol. ii. p. 570; Wien, 1817.

[11] Neue Bibliothek für die Chirurgie und Ophthalmologie; Vol. ii. p 365; Hannover, 1820.

[12] Ibid. p. 245. For a case of hydrops cysticus of frontal sinus, which occurred in the practice of Professor Jäger, see Brunn, de Hydrope Cystico Sinuum Frontalium; Berolini, 1829: and Ammon's Klinische Darstellungen, Vol. ii. p 26; Berlin, 1838.

[13] Beiträge zur Medizin, Chirurgie und Ophthalmologie, von C. C. Wuth, p. 116; Berlin, 1844. For a case of polypus in the nose, throat, maxillary, and frontal sinuses, see Levret, Observations sur le Cure de plusieurs Polypes, p. 235; Paris, 1749. For a case of huge deforming polypus of right frontal sinus, see Auvert, Selecta Praxis Medico-chirurgica; Fasciculus I. tab. v.

[14] On the diseases of the maxillary sinus, consult Bordenave, in the Mémoires de l'Académie Royale de Chirurgie; Vols. xii. and xiii. 12mo; Paris, 1774.

[15] Lettre Chirurgicale sur quelques Maladies Graves du Sinus Maxillaire et de l'Os Maxillaire Inférieur; p. 50; Paris, 1833.

[16] Boyer, Traité des Maladies Chirurgicales; Tome vi. p. 140; Paris, 1818.

[17] Ibid. Tome vi. p. 153.

[18] See a case treated by Ruffel, Mémoires de l'Académie Royale de Chirurgie; Vol. xii. p. 68; 12mo; Paris, 1784.

[19] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. iii. p. 62; Berlin, 1822.

[20] Ibid. Vol. ii. p. 397; Berlin, 1821.

[21] Chirurgie Clinique de Montpellier, par Delpech; Vol. ii. pp. 125, 130; Paris, 1828.

[22] See a case by Krimer, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. x. p. 606; Berlin, 1827.

[23] Œuvres Chirurgicales; Tome ii. p. 165; Paris, 1813.

[24] On excision of the upper maxillary bone, consult Gensoul's work already referred to: Syme, Edinburgh Medical and Surgical Journal; Vol. xliv. p. 1: Guthrie, London Medical Gazette; Vol. xvii. pp. 315, 618: Institutes of Surgery, by Sir Charles Bell; Vol, i. p. 233; Edinburgh, 1838.

[25] Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 307; Dresden, 1831.

[26] White's Cases in Surgery, p. 135; London, 1770.

[27] Howship's Practical Observations in Surgery and Morbid Anatomy, p. 22; London, 1816.

[28] Edinburgh Medical and Surgical Journal; Vol. xliv. p. 2; Edinburgh, 1835.

[29] Traité des Opérations de Chirurgie, traduit par Sollier, p. 303; Paris, 1794.

[30] Prochaska has given two engravings exhibiting a front and a side view of this skull, in his Disquisitio Anatomico-Physiologica Organismi Corporis Humani, p. 172; Viennæ, 1812. A reduced copy of these engravings, I have introduced into the text. The case of Louis Niacre, related by Alibert (Nosologie Naturelle; Tome i. p. 529; Paris, 1817), and that of a boy who died in St. Bartholomew's Hospital, referred to by Cooper (Dictionary of Practical Surgery, article *Polypus*), appear to have been examples of antral, not nasal, polypus.

[31] Practical Surgery, p. 307; London, 1846.

[32] Burns on the Surgical Anatomy of the Head and Neck, p. 484; Glasgow, 1824.

[33] Magendie, Journal de Physiologie; Tome vii. p. 180; Paris, 1827.

[34] Op. cit. p. 464.

[35] Op. cit. p. 307.

[36] Op. cit. p. 147.

[37] Ibid. p. 148; and Illustrations, Pl. 13. fig. 4. and Pl. 17. fig. 3. In pl. 16. fig. 8. Mr. Stanley has represented a fibrous tumour originating within the antrum, which, with part of the jaw, was removed by Mr. Luke.

[38] Lizars' Practical Surgery; Part ii. p. 99; Edinburgh, 1839: Gensoul, Op. cit.: Liston, Medico-chirurgical Transactions; Vol. xx. p. 165; London 1837: Solly, Medical Gazette; Vol. xxxvii. p. 89; London, 1846: Review of Dieffenbach's Operative Chirurgie, Medico-chirurgical Review for October, 1850, p. 287: Review of O'Shaughnessy on Diseases of the Jaws; British and Foreign Medical Review for July, 1845, p. 195: Horner, Dublin Medical Press; Vol. xxiii. p. 345; Dublin, 1850: Heyfelder, Medical Times and Gazette, July 10, 1853, p. 119.

[39] Boyer, Traité des Maladies Chirurgicales; Tome vi. p. 168; Paris, 1818.

[40] Dictionaire des Sciences Médicales, Tome xxxv. p. 25; Paris, 1819. See description and figures of another skull, affected with exostosis of the maxillary sinus, by Bordenave, Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 412; 12mo. Paris, 1774.

[41] Surgical Essays, by Cooper and Travers; Vol. i. p. 169; London, 1818.

[42] Guy's Hospital Reports; Vol. i. p. 403; London, 1836.

[43] Glasgow Medical Journal; Vol. i. p. 319; Glasgow, 1828. After Mrs. Craig's return home to Paisley, Dr. Anderson was informed that she died from the exostosis affecting the brain, probably by pressure.

[44] Howship, Op. cit. p. 26; London, 1816.

[45] Bright's Report of Medical Cases; Vol ii. p. 506; London, 1831.

[46] Illustrations of the Elementary Forms

of Disease; Carcinoma, Pl. ii. Fig. 7; London, 1838.

[47] Medico-Chirurgical Transactions; Vol. xxxiv. p. 43; London, 1851.

[48] Edinburgh Monthly Journal of Medical Science for May, 1842, p. 406.

[49] Series of Engravings Illustrative of Morbid Anatomy; Fasciculus X. Plate iii. Fig. 1; London, 1799.

[50] See Lawrence, Medical Times and Gazette, August 6, 1853, p. 129.

[51] Quoted from Jauchius, by Louis, in his paper on Fungous Tumours of the Dura Mater; Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 62.; 12mo; Paris, 1774.

[52] Petit, Traité des Maladies des Os; Tome ii. p. 325; Paris 1759.

[53] Travers' Synopsis of the Diseases of the Eye, p. 411; London, 1820.

[54] Landmann, Commentatio Pathologico-Anatomica exhibens Morbum Cerebri Oculique singularem; Lipsiæ, 1820.

[55] On fungus of the pericranium, skull, and dura mater, consult I. und C. Wenzel über die schwammigen Auswüchse auf der äussern Hirnhaut; Mainz, 1811: Tilanus de Funguso Duræ Meningis excrescento; Trajecti ad Rhenum, 1818: Seerig de Fungi Duræ Matris Origine et Diagnosi; Vratislaviæ, 1825: Blasius de Fungi Duræ Matris accuratiori Distinctione; Halis Saxonum, 1829: Walshe on Cancer, p. 504; London, 1846.

CHAPTER II.

DISEASES OF THE SECRETING LACRYMAL ORGANS.

SECTION I.—INJURIES OF THE LACRYMAL GLAND AND DUCTS.

It must be difficult to wound the superior portion of the lacrymal gland, or glandula innominata, with any ordinary instrument, penetrating into the cavity of the orbit; still it might be possible to reach it, for instance, with a penknife, driven upwards, backwards, and outwards, into the fossa lacrymalis; and we can easily enough suppose the inferior portion, or grandulæ congregatæ, and the excretory ducts of the gland, to be divided, in such a penetrating wound. The effects of such an injury will be apt to resemble those of a wounded parotid gland or duct; that is to say, the frequent distilling of tears, like that of saliva, will be likely to prevent the healing of the wound, and produce what is termed a *fistula lacrymalis vera.* I know of no such case on record; but the thing seems possible. A penetrating wound, then, which we suspect may have implicated the lacrymal gland or divided some of its ducts, we should endeavour to unite with more than common care; employing for that purpose sutures, strips of adhesive plaister over the wound, and a compress and roller over the eyelids, and enjoining the patient to keep the eye as much as possible at rest, till the cure be completed.

Lacerated wounds, going on to suppuration and involving the lacrymal ducts, may end in the destruction or obliteration of these canals, and give rise to incurable lacrymal xeroma.

Case 102.—Larrey relates[1] that a soldier received a musket shot towards the superior external angle of the left orbit. Half of the ball took the direction of the temple, and passed under the temporal aponeurosis, whence it was easily extracted; the other half penetrated into the orbit, and lodged in the lacrymal gland. The wound of the eyelids being enlarged, the remaining half of the ball was removed, along with the lacerated gland. The wounds healed readily, and the eye was not only saved, but continued to be sufficiently moistened to permit its ordinary motions to be performed.

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[1] Clinique Chirurgicale; Tome i. p. 396; Paris, 1829.

SECTION II.—LACRYMAL XEROMA OR XEROPHTHALMIA.

From ξηρὸς *dry* and ὄμμα or ὀφθαλμὸς *eye.* The ancient xerophthalmia, or dry lippitudo, was what is now called ophthalmia tarsi.

There are two kinds of xeroma, or dryness of the eye, the one lacrymal and the other conjunctival; the former depending on a suppressed or imperfect secretion of tears; the latter, on a deficiency of the mucous secretion, which, in the natural state, lubricates the surface of the eye.[1]

Lacrymal xeroma may be owing to a diseased condition of the substance of the gland, to a want of the proper nervous energy upon which its secretive power depends, or to an injured state of its ducts, such as may arise from an abscess behind the upper eyelid.

I am not certain that xeroma is a common, though it may be an occasional symptom, in inflammation of the gland. The assertion that it accompanies scirrhus or enlargement of that body, is contradicted by the cases related by Mr. Todd and Dr. O'Beirne.[2] Yet we can scarcely suppose that the function of the lacrymal gland will go on without impediment, when its substance is either much inflamed or greatly indurated.

We are not surprised to meet with xeroma in old people, either by itself, or attendant on amaurosis; for in them the gland is shrunk, and the nervous energy of the fifth, like that of all the nerves, diminished. We meet, however, with this symptom as a frequent attendant on the incipient stage of amaurosis, even in those not far advanced in life: and we hail, as a favourable omen in such cases, the return of the lacrymal secretion; for we almost invariably find that after this change, vision begins to improve.

Chronic pains of the head are sometimes greatly relieved by a renewed activity of the lacrymal gland.[3]

We may regard the xeroma which occasionally attends deep grief, as a purely nervous or sympathetic phenomenon.

In all those cases, when we look at the eye, no appearance of dryness is to be observed; for the mucous secretion of the conjunctiva is not affected. The eye looks as moist and slippery as ever, but the patient complains that it is never wet; or if it be at times bedewed with tears, great relief is experienced, evidently showing that the dryness depends on want of the lacrymal, not of the conjunctival, secretion.

If xeroma seems to depend on inflammation of the lacrymal gland, or if we suspect any incipient affection likely to lead to enlargement or change of structure of that body, local bleeding, and other antiphlogistic remedies, will be proper. Sternutatories are found useful, when want of nervous energy seems to be the cause. If the affection appears to be sympathetic, purgatives, tonics, and antispasmodics may be had recourse to. The influence of music has sometimes been very remarkable in removing the xeroma attendant on grief.[4]

As a substitute for the tears in xeroma, Wathen recommends[5] the use of a saponaceous lotion. Three or four drops of aqua potassæ are to be added to two ounces of tepid water, filling about two-thirds of an eye-cup. This is to be applied to the open eye, for a minute or more. It gives little or no pain, brings away all the morbid excretions from off the eye and its lids, and as instantly removes what the patient calls *the cloud* from his sight. But as this will quickly return, its frequent application will be requisite. In order to excite, if possible, the natural secretion of tears, it ought to be made fresh every time it is used, and its strength gradually increased, till it becomes, not only a wash, but a stimulus.

Keeping the eye at intervals in tepid water alone, for some minutes at a time, the same author remarks, is not only a substitute for the tears, but along with the means already mentioned, serves also to relax the parts, and dispose them to resume their natural functions.

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[1] Mr. Wardrop has recorded (Lancet, 29 Nov. 1834, p. 344) a congenital case of lacrymal and conjunctival xeroma.

[2] See Section V. of this Chapter.

[3] Collections from the unpublished Medical Writings of the late C. H. Parry, M.D.; Vol. i. p. 263; London, 1825.

[4] Dictionaire des Sciences Médicales; Tome xxxv. p. 71; Paris, 1819.

[5] Method of curing the Fistula Lacrymalis, to which is added a Dissertation on Epiphora, &c., p. 71; London, 1792.

SECTION III.—EPIPHORA.

From ἐπὶ *upon* and φέρω *I carry.*

This is the reverse of the last disease; for the tears are secreted and discharged too abundantly, and too frequently. Like xeroma, however, epiphora may be regarded rather as a symptom than as a disease in itself.

Diagnosis. Epiphora, or excessive lacrymation, must not be confounded with stillicidium lacrymarum. The difference is, that the latter arises merely from some incapability in the excreting parts of the lacrymal organs to remove the tears and the mucus of the conjunctiva, after they have done their duty; while epiphora is a disease of the secreting lacrymal organs, or an over-discharge of tears.

Causes. Any mechanical or chemical irritation, applied to the conjunctiva, a particle of dust, for example, on the inside of the upper eyelid, or a grain of salt intruding into the eye, instantly produces a discharge of tears, or epiphora. This is the natural means employed to wash away the foreign body, or to dilute the chemical substance.

Inflammation of the eye, or eyelids, and especially phlyctenular inflammation of the conjunctiva, (the disease commonly known by the name of *scrofulous ophthalmia,*) is an extremely frequent cause of epiphora. We observe that the subjects of the last-mentioned disease, if they attempt to open the eye, are affected with instant epiphora and spasm of the orbicularis palpebrarum. We can be at no loss to explain the connection between the eyelids, conjunctiva, and lacrymal gland, when we recall to mind that the lacrymal nerve, a branch of the first division of the fifth nerve, having passed through the lacrymal gland, spends its ultimate branches in the conjunctiva, orbicularis palpebrarum, and skin of the upper eyelid.[1] In many cases of scrofulous conjunctivitis, the redness is slight, perhaps scarcely an enlarged vessel is to be seen on the surface of the eyeball, and as yet no phlyctenulæ have made their appearance; but the epiphora, and intolerance of light, are acute.

Epiphora is occasionally a symptom of disordered digestion, especially in children, and of worms in the intestines. Indeed, even when connected with scrofulous ophthalmia, we may regard both the ophthalmia and the epiphora as originating, in many cases at least, in improper food, and in disorder of the digestive organs. It may also be made a question, whether phlyctenular ophthalmia is not sometimes the consequence of lacrymation in children; the inordinate flow of tears being excited by the pain which accompanies teething, and by other causes. Profuse attacks of epiphora often attend hysteria and hypochondriasis, and are associated in such cases with exaggerated feelings of affliction and mental depression. In such cases, all the symptoms are confirmed and aggravated, if recourse is had to dram-drinking.

Treatment. Before prescribing any remedy, general or local, for epiphora, let us assure ourselves that it depends on no mere mechanical irritation of the eye, such as that of an inverted eyelash, a particle of dust imbedded in any part of the conjunctiva, or minute growth on the internal surface of either eyelid.

We seldom require to prescribe for epiphora alone. I have known it completely and permanently removed by an emetic. A regulated diet, purgatives followed by tonics, and occasionally antacids, will be found highly useful, in removing some of the more common causes of the disease. A mixture of rhubarb and supercarbonate of soda repeated every day, or every second day, and followed up by a course of the sulphate of quina, is a plan of treatment which I have often found effectual.

Of local remedies, the most useful are the vapour of laudanum, and the lunar caustic solution. Into a cup of boiling water, a teaspoonful of laudanum is mixed, the cup held under the eye, the eyelids opened, and the vapour allowed to come into contact with the conjunctiva. The eye is then bathed with the mixture by means of a bit of old linen. This may be done twice or thrice a day. A tincture of belladonna, used in the same way as the laudanum, is also serviceable. In some cases, nothing relieves more the irritability of the conjunctiva, on which epiphora so much depends, than a solution of from 2 to 4 grains of lunar caustic in an ounce of distilled water, dropped on the eyeball with a camel-hair pencil, once or twice a day.

Blisters are useful in epiphora. They are perhaps more likely to be so, when applied before the ear, or on the temple, as they will then act more directly on the branches of the temporal nerves, which anastomose with the lacrymal nerve.

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[1] Soemmerring, Abbildungen des menschlichen Auges. p. 44; Tab. iii. Fig. 5; Frankfurt am Main, 1801. Rosenmüller, Partium Externarum Oculi Humani Descriptio; § 162; Lipsiæ, 1810.

SECTION IV.—INFLAMMATION AND SUPPURATION OF THE LACRYMAL GLAND.

§ 1. *Inflammation and Suppuration of the Glandulæ Congregatæ.*

This is by no means an uncommon affection; and having somewhat the appearance of a hordeolum or stye, it often passes as such. The external angle of the eyelids is swollen, red, and painful; and if the upper lid is raised, several of the acini of the glandulæ congregatæ are seen to be enlarged. In the course of a few days, one or more of them point and discharge pus, on the inside of the upper or lower lid, close to the commissure. Sometimes, on pressure, a long thread of matter may be seen oozing from one of the lacrymal ducts. Considerable pain attends the suppuration of the glandulæ congregatæ, and not unfrequently there is chemosis of the conjunctiva of a whitish colour, with puriform secretion from the membrane.

The causes are similar to those of hordeolum. In one case, I found that a hog's bristle, lodged in the upper sinus of the conjunctiva, had brought on this affection. I admitted a boy as a patient at the Glasgow Eye Infirmary, who, in consequence of a blow with a stone, was affected with swelling and redness of the upper eyelid towards its outer extremity; the eyebrow was elevated, and the eyelid depressed; and on raising the eyelid, a considerable fleshy projection was seen between the inside of the eyelid and the eyeball, which I considered to be the inferior portion of the lacrymal gland in a state of inflammation.

Warm fomentations, and a small poultice of bread and warm water, contained in an oiled bag, generally form the treatment. Leeches are seldom demanded; the disease is generally too far advanced before we see it, to admit of resolution by cold applications; and the lancet is rarely required to evacuate the matter.

§ 2. *Inflammation and Suppuration of the proper Lacrymal Gland.*

The glandula innominata, or superior portion of the lacrymal gland, is liable to become inflamed, constituting, from the size of the part affected and the deepness of its seat, a much more serious disease than the one now described. Children of a scrofulous constitution are the general subjects of this affection, which is by no means a common one.

Symptoms. Pain in the seat of the gland, and increasing fulness above the external angle of the eyelids, are the first symptoms which are remarked. By and by, a red and tense swelling rises at the upper outer angle of the orbit; the upper lid can be raised with difficulty, if at all; the conjunctiva is inflamed, and the eyeball is pushed forwards from the orbit. When the inflamed gland is enlarged to the utmost, the sympathetic swelling of the neighbouring cellular substance and the chemosed conjunctiva advance so much in front of the globe of the eye, as completely to conceal it. The pain in the orbit and head becomes more and more severe. Unless the progress of the inflammation is arrested, fever, restlessness and delirium, usher in the local symptoms of suppuration; fluctuation becomes more and more distinct; and at last the matter points and bursts, by one or more openings through the upper eyelid. The skin of the upper lid may slough to a considerable extent before this happens. From the matting together of the parts, the eyeball is apt to be left in a distorted state, being turned towards the temple. Sometimes before exit is afforded to the matter by the spontaneous bursting of the abscess, the periosteum of the fossa lacrymalis takes on inflammation, and the bone becomes affected. The case then turns out a very tedious one, ectropium of the upper eyelid follows (Fig. 3. page 32), and the fistula, as has already been explained, does not heal till the bone becomes healthy, or till the diseased portion of it is discharged, which may not be accomplished for years.

Causes. Blows on the external angular process of the frontal bone, even slight lacerated wounds of the upper eyelid, and exposure to cold, are, I believe, the common causes of inflammation of the lacrymal gland. I have known the glandula innominata to suppurate and burst, in little more than eight days after an injury of the upper lid. Mr. Todd states, that the greater number of cases which had fallen under his observation, were not idiopathic, but succeeded to inflammation of the conjunctiva, or some other form of ophthalmia. He had known inflammation of the lacrymal gland to accompany what he terms the psorophthalmia of children, when that disease was severe, or aggravated by neglect, exposure to cold, or by the incautious use of stimulating or astringent applications. He is also of opinion that, in some cases, inflammation of the gland ushers in the ordinary forms of ophthalmia, and gives rise to symptoms generally attributed to inflammation of the eye alone.[1]

Besides the acute form, there is a chronic inflammation of the lacrymal gland, almost entirely confined to the early periods of life, and, in all probability, depending on a scrofulous predisposition. In this affection, there is obvious enlargement of the gland, with occasional œdematous tumefaction of the upper eyelid; the patient seldom complains of much pain, but generally of a sensation of fulness above the globe, and an inability to move the eye of that side as freely as the other. On making pressure between the globe of the eye and the temporal extremity of the upper edge of the orbit, an immediate and copious discharge of tears is produced. Mr. Todd inclines to attribute scrofulous ophthalmia to the morbid secretion of the lacrymal gland, during the course of chronic inflammation; and mentions the case of a young lady, who, on one side had chronic inflammation of the gland, with frequent attacks of pustular conjunctivitis, while on the other side, the gland was healthy, and no ophthalmia ever occurred.

Besides chronic inflammation, Mr. Todd represents the lacrymal gland as subject to an affection still more decidedly scrofulous, characterized by the age and constitution of the patient; by slowness of progress, although the gland in this disease sometimes acquires considerable magnitude; absence of pain; and the tumour presenting a surface more or less lobulated. He states that in some instances this affection, after a certain period, will continue stationary for many months, or even for years, while in others it will undergo that form of suppurative inflammation peculiar to scrofulous glands, and will thus prove a tedious and troublesome disease. It is probable that this scrofulous enlargement of the lacrymal gland, especially when the affection has existed on each side, has sometimes been confounded with the diseases to be described in the next Section.[2]

Treatment. In acute inflammation of the lacrymal gland, leeches are to be applied liberally to the upper eyelid, forehead, and temple; blood may also be taken from the temple by cupping; purgatives, rest, cooling lotions, and the whole antiphlogistic plan of treatment are to be adopted; venesection is to be employed, if the fever runs high. Calomel, with opium, is to be given, in frequent small doses.

In cases of chronic inflammation of the lacrymal gland, or of slow scrofulous enlargement, the anti-scrofulous regimen is to be prescribed; nourishing food, sea-air, tonics, &c. The constant application of cold cloths; a few leeches to the neighbourhood of the gland; a succession of small blisters to the forehead, temple, and back of the ear; small doses of calomel, or blue pill, at night, with a saline, or other laxative, next morning, will also prove beneficial. Iodide of potassium, I have found a slow, but effectual, remedy. If scrofulous inflammation of the gland ends in suppuration, we must not allow the skin to become extensively diseased, but employ the lancet as soon as fluctuation is distinct. If protrusion and disorganization of the eye be threatened, the gland ought to be extirpated.

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[1] Dublin Hospital Reports; Vol. iii. p. 408; Dublin, 1822.

[2] See Daviel's 2nd and 3rd Cases of Extirpation of the Lacrymal Gland, in the Medical Gazette; Vol. iii. pp. 523, 524; London, 1829.

SECTION V. — CHRONIC AND SPECIFIC ENLARGEMENTS OF THE LACRYMAL GLAND.

Chronic enlargement, as well as inflammation, affects either the glandulæ congretatæ, or the grandula innominata separately; but it is rarely the case that both portions of the secreting lacrymal apparatus are involved in disease at the same time.

§ 1. *Hypertrophy of the Glandulæ Congregatæ.*

I have seen the glandulæ congregatæ on both sides affected with chronic enlargement. The upper eyelids drooped at the temporal extremity, while the glands presented granulated tumours, of the size and nearly of the shape of an orange seed. Similar cases are noticed by MM. Laugier and Richelot, by whom they were treated antiphlogistically at first, and afterwards by the exhibition of sulphate of quina.[1] Dr. A. Anderson reports a case in which, in addition to repeated leeching, the inunction of mercurial ointment was useful.[2]

2. *Hypertrophy, Chloroma, Scirrhus, and Medullary Fungus of the Lacrymal Gland.*

The lacrymal, like other glands of similar structure, suffers several kinds of slow enlargement, one of which has generally been regarded as scirrhous. Besides scirrhus, however, cases on record show the gland to be subject to simple hypertrophy, to medullary fungus, and to a peculiar affection different from all of these.

Symptoms. Whatever be the nature of the chronic enlargement of the lacrymal gland, the progress of the disease may be divided into four stages. In the *first*, the eyeball is protruded directly forwards, and cannot be turned readily towards the temple; the patient complains of epiphora, with burning heat and lancinating pain in the upper and external part of the orbit; but presents no perceptible swelling in that region. In this stage, which may last for years, it may be difficult to diagnosticate an affection of the lacrymal gland. In the *second* stage, there is more protrusion of the eyeball from the orbit, bleedings sometimes occur from the nostril, the upper lid is expanded and puffy, and the gland is so much enlarged as to form a projecting tumour, which through the skin of the upper lid, or by the finger carried into the upper sinus of the conjunctiva, can be felt to be hard and lobulated. In the *third* stage, the gland increases so much, that it pushes the eyeball downwards, inwards, and forwards, but chiefly forwards, till it seems actually to hang upon the cheek. If the disease be neglected, or the patient refuses to submit to treatment, the *fourth* stage ensues, in the course of which the temporal side of the orbit in some cases begins to be dilated, the eyeball actually resisting the pressure better than the bones; but more commonly the protruded eye inflames, swells, suppurates, and bursts; its contents are partly evacuated, partly absorbed; the gland goes on to enlarge till it completely fills and dilates the orbit, the bones of which are sometimes partially removed by progressive absorption, or destroyed by ulcerative inflammation; the lids are greatly expanded, and the lower one everted; the remains of the eyeball are seen lying on the front of the tumour, which being covered by the distended and inflamed conjunctiva, is apt to be taken for fungus hæmatodes, or some other enlargement of the eye itself; still continuing to grow, the gland presses itself downwards through the spheno-maxillary fissure, obliterates the corresponding nostril, and even deforms the brain; the patient is at length seized with apoplectic symptoms, or dies worn out by pain and fever.

The course of the symptoms varies in different cases. In some the eye-ball is slowly pressed aside, and the orbit dilated, without much inflammatory action. In other cases, violent exophthalmia occurs early, with inflammation of the whole contents of the orbit. Double vision is experienced sometimes in the second stage; in other cases, not till the third. Dimness of sight, and at length blindness occur, more or less early; but it is surprising to what extent sight is sometimes retained with a great degree of protrusion of the eyeball and stretching of the optic nerve. Although it is generally the case that the eyeball is pushed from the orbit by the tumour, it sometimes happens that the tumour advances in front of the eyeball, and covers it completely. Thus, in a case operated on by Sir P. Crampton, on removing the tumour, which was at first supposed to be an ocular fungus, the collapsed eyeball was found beneath and behind it.[3]

As the enlarged gland lies between the orbit and the levator palpebræ superioris, the latter is pressed upon, and loses its power of contraction; the upper eyelid hangs, therefore, almost motionless, over the protruded eyeball, and is flaccid, swollen, and strewed with varicose vessels. The lower eyelid is always more or less everted.

Diagnosis. As several other kinds of tumour within the orbit, cause protrusion and disorganization of the eyeball, we must carefully examine whether the gland is actually felt hard, lobulated, and enlarged. Cases occur in which the lacrymal gland and the eyeball are pushed forward together, by a tumour deep in the orbit, and we may fall into the error of supposing the lacrymal gland to be the cause of the exophthalmos, while the gland is really not enlarged, but merely displaced. In such cases the gland, though it feels lobulated, is soft, not hard and resisting. After the eyeball bursts, the appearances in cases of chronic enlargement of the lacrymal gland might easily impose on a careless observer for those of fungus hæmatodes of the eye, as may readily be concluded from examining the two figures in Mr. Travers' 5th plate; figure 1. representing fungus hæmatodes of the eye, and figure 2. an enlargement of the lacrymal gland.[4]

Considerable difficulty is likely to occur, in forming a diagnosis between enlarged lacrymal gland and the disease described by Schmidt under the name of *hydatid*, but which, I am convinced, is nothing more than an encysted tumour closely connected with the gland. An exploratory puncture would decide the question.

Diversities. It is extremely probable, that different kinds of chronic enlargement of the lacrymal gland have been confounded with each other. That the enlargements which produce the symptoms now described, are in all or many cases malignant, may fairly be doubted on the following grounds: — 1st. Their occurring in children as well as adults; 2nd. The extreme slowness with which their course generally proceeds; 3rd. Their seldom, if ever, affecting the lymphatic system; 4th. Their seldom, if ever, undergoing any thing like cancerous ulceration; and 5th. The extreme rarity with which any thing like malignant disease has been known to return in the neighbouring parts, after extirpation of the gland.

Independently of scrofulous affections, such as have been referred to in last section, there seem sufficient grounds to admit the following kinds of chronic enlargement of the lacrymal gland: — 1. Simple hypertrophy; 2. Chloroma, or fibro-plastic tumour; 3. Scirrhus; 4. Medullary fungus. Of some recorded cases, the nature is doubtful.

1. *Simple hypertrophy.* — The following congenital case of this sort is recorded by Gluge: —

Case 103. — A tumour had been observed from birth in the region of the left lacrymal gland. It slowly extended itself, pushing the eyeball downwards and inwards. Dr. Cunier extirpated it, when the patient was 5½ years old. The operation was tedious and difficult. The extirpated mass, handed to Dr. Gluge in morsels, was at least equal in size to a hen's egg. It consisted of the glandular substance and of the ducts, both in a hypertrophied condition. The internal surface of the glandular vesicles was lined by epithelial cells; and the whole structure normal, only increased in volume.[5]

2. *Chloroma, or fibro-plastic tumour.* — The greater number of cases of enlarged lacrymal gland come under this head, the term *fibro-plastic tumour* being nearly synonymous with the *simple sarcoma* of former surgical authors.[6]

Case 104.—I have now before me two greatly enlarged lacrymal glands, which proved the cause of death in a girl of eight years of age, who, from a distance, was brought for advice to the Glasgow Eye Infirmary, on the 17th of December, 1830.

It was stated by the parents of the child, that for about five weeks they had observed the left eye protruding from its socket, and for four weeks the right eye also. The disease on both sides had rapidly increased. The cornea of the left eye had already sloughed. The right eye was œdematous, but its power of vision was still considerable. The child complained of sudden attacks of pain in the eyes, but nowhere else. Some discharge of blood had taken place from the right nostril, the day before she was brought to the Infirmary. The patient's appetite was impaired, her bowels costive, her urine scanty, and she slept little. From the Journals of the Infimary it appears that iodine, an opiate, laxatives, and blisters behind the ears, were ordered.

On the 24th, the report states the pain to be on the whole diminished. The protrusion of the left eye, however, was increasing. The right cornea was partly ulcerated, the iris inflamed, and the humours muddy. The bowels were more regular, and the urine natural in quantity.

On the 22nd of January, 1831, the swelling of the left eye is said to have increased; the disease of the right to be stationary, the patient still discerning light and shadow with it, the pain gone, no discharge from the nostril, the appetite good, and the sleep natural. On the 31st, both eyes, it is stated, protruded enormously, the posterior portion of the globe projecting between the lids, and covered by the palpebral conjunctiva in a state of eversion. For two days, the patient had had more pain in the right eye. After this date, the child was not again brought to the Infirmary. We afterwards learned, however, that she had continued to experience relief from the opiate at night, so that, although often restless and lying mostly on her face, she never complained of pain. For some weeks before death she was deaf. About 48 hours before that event, which happened on the 9th of March, there was a good deal of hæmorrhage from the right nostril. She was convulsed about an hour before she expired. She was never comatose nor delirious.

To Mr. John Watt, then practising as a surgeon in Glasgow, I am indebted for the following account of the appearances on dissection :—

On withdrawing the integuments in the usual way, the bones of the cranium were observed to be here and there of a light green colour. During the process of sawing the cranium, there flowed from the vein which communicates between the integuments and the longitudinal sinus, through the right parietal bone, about four ounces of bloody serum. A number of small tumours were found growing from the dura mater, corresponding to the spots of bone which showed the green appearance above mentioned.

Four small tumours, also growing from the dura mater, each about the size of a shilling, were observed, one over the cribriform plate and crista galli of the ethmoid, one on the petrous portion of each temporal bone, and one at the junction of the lambdoid with the sagittal suture. In all these places, the bones were carious, and the tumours dipped into the carious spots.

A large quantity of serous fluid was effused under the tunica arachnoidea, particularly towards the occiput. The brain was otherwise healthy. There was no appearance of disease about the optic nerves.

On reflecting the integuments over the face, each orbit was found to be occupied by an oval lobulated tumour, nearly $2\frac{1}{2}$ inches in length, and $1\frac{3}{4}$ inch in thickness. These tumours, which were regarded as the lacrymal glands greatly enlarged, adhered firmly to the periosteum, where it is reflected from the os frontis to give support to the upper eyelids and contents of the orbits. This membrane being cut through, the enlarged glands were easily turned out with the fingers, and dissected from the conjunctiva and integuments.

The tumours, externally smooth, but lobulated, exactly resembled each other in size, texture, and every other particular. They were of a light greenish or whey colour, the exact colour of the tumours of the dura mater already mentioned. They also resembled those tumours in consistence, being of a firm uniform texture, perfectly homogeneous in their interior, and without the least appearance of the whitish bands, seen in scirrhus. They not merely completely filled the orbits, but projected about three quarters of an inch beyond the os frontis, pressing forwards the eyeballs, the humours of which had either been absorbed, or evacuated, while their coats were shrivelled, dry, and pressed down upon the cheeks. A small tumour of the same greenish colour, and firm texture, was found on the pars plana of the ethmoid, in the right orbit, which was also carious, with the tumour dipping into the nose. The hæmorrhage might have been from this, or from the tumour on the cribriform plate.

This case bears considerable resemblance to one related by Mr. Allan Burns, in which the lacrymal gland on each side, the lining membrane of the nasal sinuses, and the dura mater, were all affected with the same sort of degeneration. Mr. Burns[7] supposes the disease to have been of a specific nature, and one *sui generis*.

The fact that the lacrymal gland is occasionally converted into a morbid structure, of firm consistence and greenish colour, while, at the same time, the dura mater, periosteum, and Schneiderian membrane give origin to tumours of a similar description, is particularly worthy of attention. Besides the case above related, and Mr. Burns' case, other instances of this disease are recorded. In a case published by Dr. J. H. Balfour[8], the eyeballs were protruded and destroyed, and numerous green tumours of the same sort as those into which the lacrymal glands were converted, were attached both to the outside and inside of the skull, and grew from both surfaces of the dura mater. In a case recorded by M. Durand Fardel[9], the lacrymal glands were not affected, but green tumours were found between the dura mater and the arachnoid, between the bone forming the external meatus of each ear and its lining membrane, in each tympanum, in the spleen, and in the cellular membrane surrounding the rectum.[10]

Case 105. — A case of chloroma occurred to Dr. King of Glasgow, in July 1849, in a girl, aged 6 years and 7 months. The tumours occupied both temples, the roof and superciliary region of each orbit, the upper part of the forehead, and the vertex. A remarkable circumstance about the tumours was, that by times they increased and again subsided. Thus the one occupying the roof of the right orbit increased to such a degree, as to prevent the eye from being exposed, and again decreased so as to allow the action of the lid. A tumour formed on the mastoid process of the temporal bone, fully larger than a pigeon's egg, but had nearly disappeared before death. The patient gradually sunk, and died on the 5th October.

On withdrawing the scalp, the crown of the head presented an extraordinary appearance, being nodulated all over with flattened swellings of a yellowish-green colour. On dividing the temporal aponeuroses, the situation of the temporal muscles was found completely occupied by the peculiar green substance. The two swellings over the eyes were growths of the same nature, covering the superciliary ridge and the outer portion of each orbital plate of the frontal bone, pressing the left eyeball downwards and outwards, and the right more directly downwards. The whole contents of the orbits were converted into the same green substance, with the exception of the eye, its muscles, and the optic nerve. The various bones entering into the composition of the orbits were partially diseased, spiculæ of bone projecting from them into the tumours. No trace of orbicularis palpebrarum on either side could be detected.

A tumour occupied the external surface of the inferior maxillary bone. The inside of the dura mater presented two flattened masses, one on each side of the falx, pressing into the substance of the brain.

In all these situations, the diseased masses presented exactly the same character, except in so far as it varied from being intermixed with the surrounding fibrous, osseous, or muscular tissue. The fibrous tissue appeared the matrix from which the morbid formation arose. The masses were perfectly homogeneous, without trace of blood vessels. Both alcohol and water speedily diminished the intensity of the green colour. No bile could be detected in the alcohol in which the tumours were preserved. The substance of the tumours contained no appreciable sulphur, leading to the supposition that it was neither albuminous nor fibrinous.

Some parts of the external table of the skull and its periosteum were perfectly natural; but in all the places occupied by the tumours, the periosteum was either closely adherent to the diseased structure, or apparently lost by being converted into its substance. In all these places, the surface of the skull was covered by a layer of additional or new bone, presenting a honeycomb structure, or consisting of irregular spiculæ and thin plates of bone, growing from the outer table of the skull, and leaving irregular depressions between them, which seemed to reach to the surface of the natural bone. Into these depressions the substance of the tumour, or the periosteum altered in the manner before mentioned, extended by a corresponding set of irregular processes. The same arrangement, though to a less extent, existed in some limited portions of the internal table, corresponding with the diseased external table.

On examining the preparations, illustrative of this case, preserved in the Anatomical Musuem of Glasgow College, the periosteum of the lacrymal fossæ appears to be the origin of the tumours which projected from the orbits, while the lacrymal glands seemed transformed into the same substance as the tumours. The fibroplastic matter has infiltrated and changed, rather than displaced, all the parts with which it had come into contact, except the nerves, the muscles in the orbits, and the eyeballs.[11]

Chloroma, or green tumour, unless it belongs to the class of *amorphous fibrous tumours* of Vogel, or *fibro-plastic tumours* of Lebert[12], is probably different from any of the morbid formations generally recognised by pathologists. The green colour has attracted the notice both of Vogel and Lebert; and as it does not depend on bile, they attribute it to a peculiar proximate principle.

The following case I regard as one of the fibro-plastic description :—

Case 106.—Some years ago, I inspected the body of Mrs. F., aged 60 years, a patient of the late Dr. G. C. Monteath. She had long been affected with protrusion of the right eye downwards, inwards, and forwards; and some years before her death, the eye had burst We found the empty sclerotica lying on the front of a tumour, which was white and granular, the grains being evidently the enlarged acini of the lacrymal gland. It was as large as a man's fist, occupying a much-expanded orbit, and pressing itself down into the spheno-maxillary fissure. It had been the means of destroying, by absorption, the roof of the orbit, which was still covered by dura mater, except in some few points, where the tumour and the brain were in contact. It had deformed the brain in a remarkable degree, having pressed the lower surface of the anterior lobe of the right hemisphere upwards, and the anterior surface of the middle lobe backwards. The right motor oculi nerve was absorbed. Within the cranium, the right optic nerve was smaller than the left; within the orbit, merely its neurilema remained. The right nostril was obliterated by the presence of the tumour. The frontal and maxillary sinuses on the right side were full of puriform mucus. This patient had all along refused to submit to any operation.

The case of Andrew Smith, related by Dr. Halpin[13]; that of Mary Gibbons, by Mr. Pemberton[14]; and that of David Gibson, by Dr. A. Anderson[15]; coincide in many particulars with M. Lebert's description of fibro-plastic tumour.

3. *Scirrhus.* The evidence that the lacrymal gland is subject to scirrhus is by no means ample.

Himly extirpated the gland, for what he believed to be scirrhus. He seems to have been so disappointed by the result, that he never again had recourse to the operation, The eyeball did not retreat into the orbit, vision was not improved, and the patient returned with the eyeball affected, he says, with the disease. The proof, however, that the eyeball was affected with scirrhus, is quite unsatisfactory. The patient was a young woman, evidently suffering from scrofula, and the disease of the eyeball appears to have been rather a staphylomatous degeneration of the choroid and sclerotica, than any thing malignant.[16]

Mr. Travers tells us, that he "removed the lacrymal gland greatly enlarged, and in a state of true scirrhus, from the orbit of a middle-aged man;"[17] but Mr. Lawrence hints that the circumstance of a lacrymal gland being greatly enlarged rather militates against the opinion that in that state it is affected with scirrhus. "The female breast," says he, "when afflicted with scirrhus, is not usually augmented in bulk; sometimes, on the contrary, it is diminished."[18]

In Mr. Lawrence's case of John Clifton, the extirpated gland was of "the size of a large walnut, and of compact homogeneous texture. It had a light yellow texture, with an appearance of radiated fibres at one point; it approached in firmness to cartilage, and altogether bore a near resemblance to the firmest part of a scirrhous mammary gland." The operation was performed in 1826. The wound healed completely by adhesion, and the globe of the eye, which had been protruded, regained its natural position. In 1839, however, when Mr. L. saw the patient again, a hard swelling had formed about the middle of the cicatrice, under the superciliary ridge, a circumstance which is certainly suspicious.[19]

Gluge mentions the case of a man, 40 years old, in whom hypertrophy of the lacrymal gland passed into a state of cancer. The tumour arose without any known cause, and being partially extirpated, it speedily grew again.[20]

4. *Medullary fungus.* The only case I have found recorded of medullary fungus of the lacrymal gland, is one in which the gland, along with the eyeball, was extirpated by Dr. Tourtual, jun. The eyeball was pushed nearly an inch beyond the margin of the orbit, the cornea became opake, the temporal side of the orbit protruded, and and the patient suffered from hectic fever. The tumour was covered with a brownish envelope, being within of brain-like appearance. Three years after the operation, a soft, painful swelling rose in the temporal fossa, the hectic fever returned, and in half a year the patient died.[21]

Doubtful. Three cases by Daviel[22], one by Todd[23], one by O'Beirne[24], Lawrence's second case[25], one by Schott[26], and Bridget Judge's case by Roe[27], must be placed under this head, their nature not being sufficiently evident.

Causes. In a majority of the cases on record, chronic enlargement of the lacrymal gland is ascribed to blows and other injuries, as exciting causes.

Treatment. In the early stage of enlargement of the lacrymal gland, leeching and cupping may be tried, on the same principle which is followed when we endeavour to reduce a suspected scirrhus of the mamma. A succession of blisters may be applied to the forehead and temple. Iodine, and other solvents and sorbefacients ought to be used.

If such means are ineffectual in reducing the swelling, extirpation of the gland is the only other resource, and ought to be employed, especially if we have reason to regard the case as one of simple enlargment, or of chloroma. In cases of scirrhus or medullary fungus, the operation can be regarded only as a palliative. Chloroma or fibroplastic tumour is a non-malignant disease; the circumstance, however, of its so frequently implicating other organs along with the lacrymal gland, and especially the dura mater, materially affects the prognosis.

The mode of operating is to cut down directly over the tumour, through the integuments and fibrous layer of the upper eyelid, parallel to the edge of the orbit. As the gland lies over the levator palpebræ, this muscle is avoided in this method of operating, which it could scarcely be were the operation attempted through the conjunctiva. The gland being exposed, projecting from the lacrymal fossa, it is to be insulated as much as possible with the scalpel. If it is considerably enlarged, this is not accomplished without some difficulty, owing to the impacted state of the gland between the bone above and the eyeball beneath. Sometimes a blunt-pointed instrument is useful in tearing through the cellular tissue; or we feel all around the gland with the finger, and cautiously cut through the connections. When it is pretty well insulated, we seize it with the double volsella, and drawing it out of its place as much as possible, divide its remaining adhesions. This is accomplished with more or less difficulty, according to the degree of matting together of the parts, produced by previous inflammation.

The eyeball is to be removed, if already destroyed. If entire, it is to be left untouched, whether vision be preserved or not. The bleeding in general is inconsiderable. After it has ceased, the edges of the wound are to be brought together with stitches and stripes of adhesive plaister.

The eyeball in some degree goes back immediately into the orbit, and the patient opens and shuts the eye, if the levator be safe. The parts swell a good deal, so that in a few days the eye is again pushed out, and a considerable quantity of pus may escape from the wound. Gradually the swollen state of the lids subsides. Neither is vision nor the position of the eye restored immediately. Weeks, or even months, may be requisite before these objects are accomplished; and although the malposition of the eye is always lessened in time, if not entirely removed, vision may never return. The moisture and lubricity of the conjunctiva remaining unaffected after extirpation of the lacrymal gland, has partly given rise to the statement, that the patient continues capable of weeping. Tears are undoubtedly discharged, however, from an eye from which the glandula innominata has been removed, owing, no doubt, to the glandulæ congregatæ being left untouched.

Cases of extirpation. The details which had previously been given on the subject having been but comparatively few[28], a great degree of interest has attached itself to the two following cases by Mr. Todd and Dr. O'Beirne, to which I have already referred: —

Case 107.—Mr. Todd's patient was a woman of 70 years of age. The lacrymal gland formed a large irregular tumour, occupying the upper part of the orbit, projecting more than half an inch beyond the superciliary ridge, and covered by the upper eyelid, which was so stretched upon it as to render the knotty eminences on its surface very conspicuous. The tumour was extremely hard. It was moveable to a slight extent, in a transverse direction only. The globe of the eye was not enlarged; but it had been protruded by the tumour, and was so low upon the cheek that the cornea was nearly on a line with the edge of the ala nasi. The lower eyelid was everted, and appeared dragged down with the globe; the conjunctiva much thickened, and chemosed; the transparency of the cornea slightly obscured. There was no apparent disease of the interior of the eye. Vision was destroyed by the pressure of the tumour. The pains were severe and lancinating, extending from the tumour to the globe of the eye, and were accompanied with a sensation of heat and a frequent discharge of scalding tears. The sufferings of the patient were most severe at night, and she was almost entirely deprived of sleep; notwithstanding which, her general health was not much impaired, and her appetite was good. She attributed the disease to a blow received on the eye about seven years before; from which period she had been subject to frequent discharges of tears from that eye, but had suffered no other inconvenience until a year before coming under Mr. Todd's care, when the tumour began to project under the temporal extremity of the eyebrow. At first, she had no pain or headache; but as the tumour increased, these symptoms set in, and ultimately became so severe that she was anxious to undergo any operation which held out a prospect of relief.

In consultation with Mr. Carmichael, Mr. Todd determined that an attempt should be made to extirpate the diseased gland alone, and in the event of that being found impracticable, either from extent of attachments or deep-seated disease, the expediency of removing all the contents of the orbit was fully acceded to; the intense sufferings of the patient, the probable nature of the disease, and the useless state of the eye, appearing to render this an indispensable alternative.

The patient having been placed on her back on a table, with her head a little elevated and secured by the assistants, a transverse incision was made through the integuments, nearly parallel to the superior margin of the orbit, from one extremity of the tumour to the other. Having cut through the orbicularis palpebrarum and the ligamentum tarsi, Mr. Todd exposed, by a careful dissection, the entire anterior surface of the gland. Being firmly wedged into the orbit, it was not without difficulty that the handle of the scalpel was introduced between the gland and the superciliary ridge, in order to detach it from the orbitary process of the frontal bone. The surface of the gland next the eye was irregularly lobulated, and the lobes had insinuated themselves among the muscles and other contents of the orbit, so as to render their disentanglement extremely difficult and hazardous. By cautiously tearing their cellular attachments with the end of the finger, the handle of the knife, and the blunt extremity of a director, and by cutting on the finger with a probe-pointed bistoury some firm membranous bands, which could not be easily broken, Mr. Todd succeeded in extracting the entire tumour. On a careful examination, no farther disease could be detected in the orbit, and as no bleeding occurred, the globe of the eye was gently pressed towards its natural situation, the wound dressed, the parts supported with a compress and bandage, and the patient laid in bed, with strong injunctions to observe the strictest quiet.

The extirpated gland was much larger than a walnut. On the surface which had been towards the eye, it presented three considerable eminences or lobes, with deep fissures between them. It was almost as firm as cartilage, and more elastic. A section exposed several small cartilaginous cysts, which contained a glairy fluid, the interspaces consisting of a firm fatty substance, traversed by a few membranous bands.

Two hours after the operation, an alarming hæmorrhage took place, which, from the great depth at which the wounded vessel was situated, and the extensive extravasation of blood into the loose cellular tissue of the orbit, was with difficulty suppressed by pressure with the finger. Dossils of lint were then introduced into the wound, and the bleeding did not recur. The patient passed a tranquil night, and for the first time during many weeks enjoyed refreshing sleep. On the following day, the appearance of the eye and surrounding parts was by no means encouraging. The globe was protruded from the orbit as much as before the operation, by large coagula, which occupied the situation of the tumour; the lids were affected with extensive ecchymosis; they were livid and cold, as if in the state of gangrene; and the cellular tissue of the conjunctiva was distended with effused blood. Notwithstanding these unfavourable appearances, the patient had experienced much relief from the operation; she was free from acute pain, and the constitutional excitement was inconsiderable. In the course of a few days, the coagulated blood contained in the orbit began to dissolve, and suppuration was soon established. The globe of the eye began slowly to return into its natural situation, and the conjunctiva and skin of the eyelids to assume their healthy appearance. On the 12th day after the operation, the improvement in the position of the eye was quite evident; but it was found impossible to prevent the eversion of the lower eyelid, in consequence of a thickened fold of the conjunctiva, which extended between it and the globe. To this fold, the nitrate of silver had been frequently applied without any benefit; Mr. Todd therefore removed it by excision, and was immediately enabled to replace the lid, which showed no farther tendency to become everted. From this period, the patient's recovery was uninterrupted, and she was discharged without any return of disease. Vision remained totally lost, the pupil greatly contracted, the position of the eyeball almost natural.

Case 108. — A man, aged 22 years, strong and athletic, came under the care of Dr. O'Beirne, with considerable deformity and imperfect vision of the right eye. The globe projected more by its semidiameter than the sound eye, yet it was covered almost entirely by the upper eyelid, which hung loosely over it, as if palsied; the pupil was dilated and insensible to light, the cornea was turned towards the nose, and the puncta lacrymalia were patulous. The upper and outer part of the orbit was occupied by a tumour, the outline of which could not be distinctly traced, but to its growth were attributed the protrusion of the eye and impaired vision. The patient suffered considerable pain of the right side of the head and face, and much irritation and watering of the eye were produced by cold air, or particles of dust. All objects appeared to him double; and in endeavouring to reach any object, his hand or foot generally fell short of it, so much so as to prevent him from working even as a labourer. About two years before coming under Dr. O'Beirne's care, he perceived first of all sparks, and occasionally mists, before his eyes, with sharp intermitting pains in the right side of his head and face; in about a year, a slight prominence and inversion of the globe were observed; and from that period, the symptoms gradually proceeded to the state already described.

It was decided in consultation, that the tumour should be removed, but it was not even suspected that the lacrymal gland was the part affected.

The operation was begun by an incision through the integuments of the upper eyelid, extending from the inner to the outer angle. The orbicularis palpebrarum being next divided, some portions of adipose substance which presented were removed. Dr. O'Beirne then introduced his finger, and at once discovered that the disease was an enlarged and indurated lacrymal gland. The anterior surface of the tumour was exposed by dissection, and it was finally removed by cautiously working with the nail of the little finger, for it was not considered safe to introduce a knife into the back of the orbit.

The surface of the extirpated gland was granular, and of a pink colour. It was enlarged to at least six times its natural size. When cut into, it presented a hard, membranous, or rather cartilaginous centre, from which septa passed to the circumference. No sanies could be perceived. On the tumour being removed, the pupil instantly recovered its contractile power, and the globe retired nearly to its natural situation. Vision, too, was improved, but not perfectly restored. Scarcely any hæmorrhage ensued, and the wound was dressed simply. With the exception of a slight erysipelas of the scalp, which yielded to the usual remedies, the patient's recovery was uninterrupted, and the wound was completely healed on the 14th day after the operation. At that time, vision was perfect, all uneasiness had subsided, and the eye occupied its proper place. The upper eyelid, however, having continued so much relaxed as to obscure a great part of the cornea, a camel's hair pencil, dipped in sulphuric acid diluted with three parts of water, was applied in the line of the cicatrice. In a few days a slough separated, and the subsequent cicatrization contracted the lid to its natural state. The patient continued perfectly well, and suffered no inconvenience from the loss of the gland.

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[1] Translation of this work into French, p. vi.; Paris, 1844.

[2] Monthly Journal of Medical Science, Vol. viii. p. 465; Edinburgh, 1848.

[3] Dublin Quarterly Journal of Medical Science, Vol. i. p. 80; Dublin, 1846.

[4] Travers' Synopsis of the Diseases of the Eye; London, 1820.

[5] Annales d'Oculistique; Tome xxiii. p. 145; Bruxelles, 1850.

[6] See Paget's Lectures on Tumours; Lect. V. Part ii.; Medical Gazette; Vol. xlviii.. p. 177; London, 1851.

[7] Surgical Anatomy of the Head and Neck, p. 385; Glasgow, 1824.

[8] Edinburgh Medical and Surgical Journal; Vol. xliii. p. 319; Edinburgh, 1835.

[9] Journal Hebdomadaire des Progrès des Sciences Médicales; Tome iii. p. 207; Paris, 1836.

[10] In addition to the cases mentioned in the text, see one by Williams, in which the pericranium, dura mater, and various other organs were affected; Medical Gazette; Vol. xliv. p. 854; London, 1849.

[11] Monthly Journal of Medical Science for August, 1853, p. 98.

[12] Vogel, Anatomie Pathologique Générale, p. 199; Paris, 1847: Lebert, Physiogie Pathologique, Tome ii. p. 120; Paris, 1845; Ib. Lancet, February 26, 1853; p. 203

[13] Dublin Quarterly Journal of Medical Science; Vol. i. p. 88; Dublin, 1846.

[14] Ibid. Vol. iv. p. 246; Dublin, 1847.

[15] Monthly Journal of Medical Science; Vol. viii. p. 464; Edinburgh, 1848.

[16] Ophthalmologische Bibliothek, von Himly und Schmidt; Vol. iii. Stück iii. p. 159; Jena, 1807: Himly, Krankheiten und Missbildungen des menschlichen Auges; Vol. i. p. 291; Berlin, 1843.

[17] Op. cit. p. 228.

[18] Treatise on the Diseases of the Eye, p. 798; London, 1841.

[19] Ibid. p. 802.

[20] Atlas der pathologischen Anatomie, Zweiter Theil, 17te Lieferung.; Tab. 3; Jena, 1850.

[21] Himly, Op. cit: Vol. i. p. 292: Ammon, Klinische Darstellungen; Vol. ii. p. 27; Berlin, 1838.

[22] Quoted in Medical Gazette; Vol. iii. p. 523; London, 1829; from a medical journal published at Bordeaux in 1829.

[23] Dublin Hospital Reports; Vol. iii. p. 419; Dublin, 1822.

[24] Ibid. p. 426.

[25] Op. cit. p. 802.

[26] Controverse über die Nerven des Nabelstrangs; advertisement at the end: Frankfurt am Main, 1836.

[27] Dublin Quarterly Journal of Medical Science; Vol. i. p. 92; Dublin, 1846.

[28] Richerand, Nosographie Chirurgicale; Tome ii. p. 31; Paris, 1808: Warner's Cases of Surgery, p. 108; London, 1784: Travers, Op. cit.

SECTION VI. — ENCYSTED TUMOUR IN THE LACRYMAL GLAND.

This disease appears to have been for the first time accurately described by Schmidt, under the appellation of *glandula lacrymalis hydatoidea.*[1]

It certainly consists of a collection of thin fluid in the situation of the superior portion of the lacrymal gland. This fluid Schmidt supposed to be tears; and the cyst in which it collects, to be originally nothing more than one of the cells of the cellular membrane, serving to hold together the acini or grains of which the gland is composed. Whether this is really a lacrymal tumour, or merely a cyst situated in the lacrymal gland, or at least closely connected with it, is, in a practical point of view, a matter, perhaps, of little consequence. Schmidt's hypothesis of the origin of the cyst is quite inconsistent with the assumption, that this disease is at all analogous to the entozoa, known under the name of hydatids.

That it is a rare disease may be concluded from the fact, that Schmidt relates only two cases of it; and that even Beer's vast experience had brought only three under his observation.[2] In one of Beer's cases, the diagnosis became completely evident only after death. In the tumour, he found a small quantity of fluid, which he does not hesitate to call tears; and which was thin, clear, and sharp and saltish to the taste. In his second case, he opened the tumour during life; the fluid discharged was yellowish like serum, but so acrid, that it immediately caused a small blister when applied to the tongue. In Beer's third case, he was merely consulted in the commencement of the disease.

Symptoms. The development of an encysted tumour in the lacrymal gland is, in some cases at least, very rapid; and its consequences not merely distressing, but dangerous. One of the most striking symptoms attending this tumour, is protrusion of the eye. It is pushed forward from the orbit, and inward, towards the nose; and ultimately may become disorganized by inflammation.

When the disease produces *exophthalmos* merely, the patient, perhaps perfectly well in every other respect, complains of obtuse deep-seated pain in the orbit. The pain is as if something behind the eyeball were pushing it out of its socket. It is felt most when the patient moves his eye in different directions, and especially when he turns it towards the temple. It daily increases. Nothing unnatural in the form or in the texture of the eye or eyelids is as yet discernible. By and by, there is added to the pain behind the eye, a feeling of tension in the orbit and over the side of the head; and the eyeball is now observed to be somewhat protruded from the orbit and towards the nose. Some few individual blood-vessels excepted, it is not red. The patient has a feeling of dryness in the eye. He cannot move it without great aggravation of the pain, and a sensation of sudden flashes of light. At last, he is totally deprived of the power of moving it. When he regards objects with the protruded eye, he sees them disfigured. If he looks with both eyes, he sees objects double, as the protruded eye stands no longer in the natural axis of vision. The more that the tumour pushes the eyeball out of the orbit, vision becomes the weaker and the more disturbed. In proportion as the disease advances, the patient loses his appetite, and is deprived of sleep. The hemicrania becomes uninterrupted, by day and night. Vision is entirely lost. The eye is so much protruded, that it rests in some measure upon the cheek. The eyelids lose all power of motion, the upper one being firmly extended over the protruded eye. The patient betrays a constant inclination to cover the eye with the eyelids, and at every attempt to do so the eyeball is rolled towards the nose. A resisting hardness is felt with the finger at the temporal angle of the eye, between the protruded eyeball and the external edge of the orbit. The eye becomes sullied and dusky. If nothing is done to relieve the symptoms, coma and death are the consequences.

Should the disease produce *exophthalmia*, besides obtuse, deep-seated, and constantly increasing pain in the orbit, there is pain in the eyeball itself; and whereas, in the former case, the eye, though protruded by the growing tumour, preserves its ordinary appearance, in the present case it is rapidly destroyed by inflammation. It suppurates; and unless opened by the knife, bursts, discharging blood and ichorous matter. The membranes do not collapse after this evacuation, but the eyeball, as a fleshy shapeless mass, continues to protrude from the orbit, proving how much its organization had suffered. The pain in the burst eye, and in one side of the head, continues, the patient is deprived of sleep and appetite, and the lymphatic glands about the face become enlarged. Should a patient present himself with such symptoms, we shall naturally be led to suspect the existence either of this disease, or of some other affection of the lacrymal gland; and our suspicions will be confirmed if we find a resisting hardness between the destroyed eyeball and the temporal edge of the orbit. It is likely, however, that this may be detected at a much earlier period of the disease.

Could we dare to draw conclusions from the few cases of this disease on record, we should say that it is more apt to terminate fatally when attended by exophthalmos, than when accompanied by exophthalmia. In neglected cases, however, of encysted tumour in the lacrymal gland, attended by exophthalmia, the disorganization is apt to spread to the bones of the orbit, and at last the brain itself becomes fatally affected. This was the termination of one of the three cases observed by Beer.

Treatment. The radical cure of encysted tumour in the lacrymal gland, would consist, no doubt, in extirpating the tumour, before the eye became protruded, at least to any considerable extent; but at this period, we cannot distinguish the disease with sufficient certainty. Even had we the means of determining that the commencing exophthalmos arose from the cause in question, it might be difficult to extirpate this vesicular swelling without removing also the gland in which it is situated, or with which it is intimately connected.

A palliative treatment, it is probable, will generally be adopted, by the employment of which we may save both the life, and the eye of the patient. It may even happen that by the early employment of this palliative cure, we may be fortunate enough to cure the disease completely.

The palliative cure consists in puncturing the tumour. This should be done, if possible, from under the upper eyelid, with a lancet or small concealed bistoury, directed towards the seat of the lacrymal gland. Should the tumour return after the healing of the wound, the operation must be repeated. I should think any attempt to keep the wound open, and the tumour constantly empty, by the introduction of a bougie or other foreign body, out of the question, if the incision were made from under the upper eyelid. But if the protrusion of the eye were such that the upper eyelid was firmly stretched over the eyeball, and that no instrument could be passed between them, the tumour would require to be opened through the upper eyelid, and the wound might be afterwards kept open by a bit of catgut, so as to give exit to any re-accumulated fluid, and perhaps lead to a radical cure.

That through the opening, wherever it be made, the cyst of the tumour shall be extracted, cannot be regarded as very likely; although this took place in one of Schmidt's cases.

As the present is a rare disease, I am induced to lay before the reader the particulars of the following cases:—

Case 109.—A private soldier, aged 26 years, of a firm and corpulent make, became ill with fever, from fatigue and exposure to cold, in the end of November 1800. According to the history of the case, he had a slight typhus, which yielded to the use of the proper means, so that he left the hospital in the beginning of January 1801, and set off for his regiment. Some days before he left the hospital, he had an obtuse deep-seated feeling of pressure in his eye; but he set himself out against it, and said nothing of it to his medical attendant. He was about eight days with his regiment, when he observed that this obtuse deep-seated pain grew more constant and more troublesome. But as he could discover nothing wrong about his eye and saw perfectly well, he let matters rest as they were. In the beginning of the third week, the feeling of pressure became violent, he felt pain with tension in the eye itself, and in the corresponding half of the head; the eye became red and dry, and began to project; he frequently had the sensation of fiery spectra, and at times his sight failed him. About this time his sleep became interrupted. With these symptoms, he was unable to perform his duty as a soldier. His medical officer ordered the application of a warm poultice. The case grew worse from day to day. With the beginning of the fourth week, the hemicrania and pain in the eye became furious, day and night, so that he could not get a moment's sleep; the eye protruded completely from its socket, so that it was seen from the other side over the root of the nose; it was slightly red, but not swollen, moist and slippery, but deprived of sight. The appetite for food, which had continued till now, was lost. The patient's restlessness rose to the extreme.

In this state he was brought to the Military Hospital of Vienna, on the 4th February. Early on the 5th, Schmidt saw him for the first time. Besides the above-mentioned symptoms, he found the patient affected with spasm of the superior oblique muscle, whereby the eye was every instant drawn more out of the orbit, and towards the nose. The eyelids were not in the least swollen, but quite pushed aside from the eye. Schmidt felt distinctly a resisting hardness in the temporal angle of the orbit. He declared before those who attended the visit, that the disease was seated in the orbit, and that it was probably a steatomatous tumour. Opium internally and externally, warm poultices over the eye and head, nothing checked the fury of the pain. Early on the 6th, Schmidt found the patient in the same state, only that the eye was no longer lively, but dusky and somewhat like the eye of a dying person, while the appearance of the sound eye was still very lively. The pulse, the respiration, and all the other functions, were not in the least altered. Schmidt determined to evacuate the eye, next day, by an incision. Towards evening, the patient fell into a state of sopor, became insensible, discharged his urine and fæces involuntarily, and died towards midnight.

On dissection, the veins and sinuses of the brain were found distended with blood. There was no accumulation of fluid in the ventricles. On removing the orbitary process of the frontal bone without injuring the periosteum, a fluctuating tumour pressed itself upwards from the temporal angle of the orbit. On continuing the dissection, the muscles of the eye, the optic nerve, and the other nerves of the orbit, were observed to be stretched and elongated, and the ophthalmic vein appeared varicose. The lacrymal gland was smaller than usual, and in connection with it lay the fluctuating tumour. The individual acini which were more remote from the tumour, and were directed towards the upper eyelid, were larger and more coherent; whilst those acini, which lay upon the tumour, were small, and both appeared and felt more loosely scattered than natural. The tumour was in diameter, from behind forwards, the length of an inch; in transverse and perpendicular diameters somewhat less than an inch. It pressed itself close upon the external segment of the eyeball, and even after death held the eyeball out of the orbit and towards the nose. It had an external and an internal covering. The external consisted of thick cellular membrane. Between this and the internal covering, was a quantity of interstitial fluid. The internal covering was very fine, semitransparent, and contained a limpid fluid. The external membrane could not be easily separated from the scattered acini of the lacrymal gland. The internal, could be freely extracted from the external, covering.[3]

Case 110.—A young country-woman came to Vienna in May, 1802, and sought Schmidt's assistance. She had weaned her child two months before; and immediately after that, upon being exposed to cold, felt violent hemicrania and pain in the eye. After some days the eyeball inflamed severely, became swollen, and pressed itself forwards from the orbit. When the woman came to Schmidt, the inflamed eye had the size of a man's fist, the cornea was completely destroyed from suppuration, and the iris was covered by a new and wartlike production, so that it was with difficulty that an eye could be recognised in this shapeless mass of flesh. Together with a constant pressing pain in the orbit, and continual hemicrania, Schmidt found all the symptoms detailed in the former case, with the exception of the spasmodic motions of the eyeball. He mentions that the parotid gland upon the same side, was swollen towards the branch of the lower jaw, but more probably the swelling affected one of the lymphatic glands lying over the parotid.

The patient was admitted into the hospital, under the care of Mr. Ruttorffer, who passed a small flat trocar under the upper eyelid, directing its point towards the fossa lacrymalis, where the resistance and hardness were felt. More than an ounce of extremely clear fluid was immediately discharged through the canula. The canula was removed, and for several days this clear fluid issued from the wound. Some hours after the operation, the hemicrania suddenly and considerably diminished, and from day to day, the exophthalmia became less.

On the 14th day after the operation, a whitish streak was observed in the wound, resembling pus, but which could not be removed with a little lint. Mr. Ruttorffer laid hold of this with a pair of forceps, and drew forth the cyst, or, as Schmidt chooses to call it, the hydatid, which, as represented in his work, must have measured more than an inch in diameter. After other 14 days, the woman left the hospital, the eye having diminished to a small stump.[4]

From the state to which the eyeball is reduced in exophthalmia proceeding from this disease, it is not unlikely that cases of this sort have sometimes been taken for cancerous affections, and the eyeball extirpated with the cyst. An instance of this kind we find in the Philosophical Transactions for 1755, related by Mr. Spry.[5]

Case 111. — A mariner's wife complained of violent pain in her left eye, and sometimes of very acute pain in the temple of the same side, with some defect in her sight. She also imagined that her eye was bigger than ordinary; but, upon inspection, it appeared no bigger than the other. The cornea, however, became less transparent, and the pupil greatly dilated. The vessels of the conjunctiva and sclerotica were no way enlarged. Bleeding, blistering, and purging, proved of no effect. On the contrary, the cornea became more opaque, great inflammation of the conjunctiva and sclerotica ensued, and an apparent prominence of the whole eye. She was again purged, and a seton put in the neck; but the symptoms increased. She became still more miserable. The conjunctiva became greatly inflamed, with eversion of the upper lid, attended with great pain. Mr. Spry often scarified the conjunctiva, which bled plentifully, and gave her ease for a day or two. He also took blood from the temporal artery. But the eye being greatly enlarged, and of so terrible an appearance, after all his endeavours for eight or ten months, he judged the disease to be carcinoma, and therefore proposed cutting out the eye as the only remedy. The operation, however, was deferred, till at length the eye becoming much larger, and the pain increasing, extirpation was had recourse to, lest the bones of the orbit might become carious.

Mr. Spry having begun his incision round the upper part of the tumour, had not cut deep when a great quantity of fluid, like lymph, poured out upon him with great force, like a fountain. The tumour subsided a good deal; but pursuing the operation, he found a large cyst, which filled the whole orbit behind the eye. A part of this cyst was left to slough off with the dressings. The whole eye being cut out, he filled the wound with lint. The cure went on with success, and was complete in a month.

On examining the tumour which had been removed, the eye appeared a little bigger than natural, the aqueous humour not so clear as usual, the crystalline less solid and transparent, the vitreous almost reduced to a liquid state, the cyst very strong and elastic, with a cavity sufficient to contain a large hen-egg.

There can be little doubt that this was a misunderstood case of encysted tumour in the lacrymal gland, or, at any rate, of encysted orbital tumour, and not at all a carcinoma.

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[1] Ueber die Krankheiten des Thränenorgans, p. 73; Wien, 1803.

[2] Lehre von den Augenkrankheiten; Vol. ii. p. 597; Wien, 1817.

[3] Op. cit. p. 90.

[4] Ibid. p. 94.

[5] Philosophical Transactions; Vol. xlix. Part i. p. 18; London, 1756.

SECTION VII. — ENCYSTED TUMOUR IN THE VICINITY OF THE GLANDULÆ CONGREGATÆ AND LACRYMAL DUCTS.

The subject of this section seems similar in nature to the disease last considered. Its seat appears the principal difference; for the tumour described in the last section is seated in the substance of the superior portion of the lacrymal gland, and is supposed to derive the fluid which it contains from the gland immediately; while the present disease lies almost immediately behind the conjunctiva, in the vicinity of the glandulæ congregatæ, and derives its fluid according to Schmidt[1], from one or more of the lacrymal ducts. Benedict[2] describes it as a mere dilatation of one of these ducts. Encysted tumour in the lacrymal gland, produces a series of dangerous symptoms, long before it comes into view itself, if ever it comes into view; whereas, a similar tumour in the vicinity of the glandulæ congregatæ and lacrymal ducts, from its superficial situation, is neither productive of so destructive effects, nor can it remain so long concealed.

Symptoms. As soon as it has reached any considerable extent, the present disease manifests itself by the following symptoms:—A circumscribed very elastic swelling, void of pain, is felt immediately behind the upper eyelid, towards the temporal side of the orbit. If the tumour has already reached such a degree as to present through the eyelid the size of a hazel nut, and if we press upon it pretty forcibly, the patient feels the pressure in the eyeball, and observes fiery spectra before the eye. If, at the same time that we press the tumour from without, we raise the upper eyelid, and, in some measure, evert it, we see the conjunctiva project in the form of a distended sac, in which we discover fluctuation. When the tumour has reached the size of a pigeon's egg, the motions of the eyeball upwards and outwards are impeded; yet, when we raise the upper eyelid in the manner just now mentioned, the patient is immediately able to move his eye, without difficulty, towards the temple, the eyeball retiring behind the tumour. From extreme distention, the conjunctiva, and the cyst in which the fluid is contained, are so thin, that the pressure we employ in examining the disease, seems almost sufficient to rupture the tumour. One of the characteristic marks of this disease, we are told, is the momentary increase of the tumour when the patient weeps.

Causes. It is supposed that the proximate cause is one or more of the excreting ducts of the lacrymal gland terminating in the loose cellular substance under the conjunctiva; that one of the cells is gradually distended by the accumulating tears, and at last forms the thin sac, the projection of which gives rise to the symptoms described. That this is the real nature of the case, is concluded from the alleged fact, that if the tumour be opened through the eyelid, a considerable quantity of pure tears flows through the incision, every time the patient weeps. I must confess that I have no faith in this etiology.

Beer[3] met with this disease six times, in individuals who were between four and fourteen years of age. In two of these cases, an apparent exciting cause had preceded the disease. In the one, the cause was a bruise on the upper edge of the orbit, from the springing of a billiard ball. In the other, it arose after the incomplete extirpation of an encysted tumour, which had its seat at the same place.

Treatment. Beer's plan of radically curing this disease, by passing a seton through the nostril, is not to be recommended. It is not only apt to fail, but may leave a troublesome fistulous opening through the lid.

Either the simple palliative cure should be had recourse to, of puncturing the tumour through the conjunctiva, or the cyst should be extirpated. If the eyelid cannot be sufficiently everted, to allow the cyst to be exposed and insulated through an incision of the conjunctiva, the extirpation should be performed through an incision of the skin, parallel to the fibres of the orbicularis palpebrarum.

It is remarkable, that the two diseases described in this and the preceding section, have not been met with, as far as I know, by any practitioner in this country.

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[1] Ueber die Krankheiten des Thränenorgans, p. 63; Wien, 1803.

[2] Handbuch der praktischen Augenheilkunde; Vol. iii. p. 163; Leipzig, 1824.

[3] Lehre von den Augenkrankheiten; Vol. ii. p. 593; Wien, 1817.

SECTION VIII. — TRUE LACRYMAL FISTULA.

A callous opening, so small as almost to elude the naked eye, situated in the upper eyelid, towards its temporal extremity, and from which there trickles from time to time a quantity of tears, is styled a *true lacrymal fistula.* If we pass an Anel's probe into the orifice, we find that it is led directly towards the lacrymal gland; but we neither perceive any hardness of the gland, feel any portion of bone bare, nor give the patient pain.

True lacrymal fistula may arise from a wound of the lacrymal gland, the glandulæ congregatæ, or the lacrymal ducts. More frequently it is the effect of abscess of the upper eyelid, or of suppuration of the lacrymal gland. It may also be the result of attempts to extirpate an encysted tumour in the vicinity of the lacrymal ducts, or to cure that disease by means of a seton.

This almost capillary fistula will require the Anelian syringe, armed with its finest point, to inject any fluid into it. Having widened the fistula, by repeated introductions of the Anelian probe, or the use of a piece of fine catgut, by passing the Anelian probe, coated with nitrate of silver, several times with a rotatory motion, through the fistula, we may expect to excite such a degree of inflammation as shall end in its closure.[1]

A stout country lad had a fistula of this kind, 3½ lines deep, and completely callous. Beer passed quickly into the opening, and to the bottom of the fistula, a red hot knitting-needle, turning it round several times upon its axis. Five days afterwards, the fistula was completely closed.[2]

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[1] To coat a probe with lunar caustic, place a bit on a piece of silver money, such as a sixpence; hold this with a pair of pliers over the flame of a candle, and roll the probe in the melted salt, till it is sufficiently covered.

[2] Lehre von den Augenkrankheiten; Vol. ii. p. 186; Wien, 1817.

SECTION IX. — MORBID TEARS.

The tears are at all times an irritating secretion. The conjunctiva is instantly reddened when they flow; and although we were to grant that this was consentaneous with determination of blood to the lacrymal gland, preceding the discharge, yet we observe that if the tears are so profuse as to run over on the cheek, the skin with which they come into frequent contact becomes inflamed and excoriated. In some cases, the extraordinary degree of inflammation which the tears have excited, has led to the supposition, that their chemical properties were changed by disease, so that they had acquired an unusual degree of acridness. In a supposed case of this kind, which some years ago attracted a considerable share of attention in Glasgow, it was discovered, that the deep lines of excoriation which ran down the cheeks of the patient, who was a child, were not the work of the tears, but the effects of a deliberate application of sulphuric acid. The woman who kept the child, tempted by some sinister motive, was the author of this extraordinary piece of cruelty.

SECTION X. — SANGUINEOUS LACRYMATION. HÆMORRHAGY FROM THE LACRYMAL GLAND.

Forestus[1], Havers[2], and others, have recorded cases in which blood flowed from the eyes like tears, or was discharged from the lacrymal gland, even in such quantity as proved dangerous to life.

Professor Rosas witnessed a disease of this sort in a child of nine years of age, of scorbutic diathesis, and in whom it yielded to antiscorbutic treatment.[3]

In all these cases, however, it is doubtful how far the discharge of blood was really from the lacrymal gland, and not from the conjunctiva.

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[1] Observationes et Curationes Medicinales, Lib. xi. Obs. 13; Francofurti, 1634.

[2] Philosophical Transactions, No. 208. Lowthorp's Abridgment; Vol. iii. part i. p. 252; London, 1716.

[3] Handbuch der Augenheilkunde; Vol. ii. p. 347; Wien, 1830.

SECTION XI. — DACRYOLITHS* OR LACRYMAL CALCULI IN THE LACRYMAL DUCTS.

* From δάκρυ *tear*, and λίθος *stone*.

The tears, like the saliva and all other fluids transmitted along mucous surfaces, are occasionally the source of calcareous depositions. In all such cases, the concretions which are met with, consist of the chemical constituents of the fluids by which they are surrounded; but they also occasionally contain principles derived from the mucous membrane. Their forms they borrow from the cavity in which they are contained, or from the surrounding structures with which they are brought in contact, as is observed in gall-stones, urinary calculi, intestinal calculi, salivary calculi, &c.

Case 112.—MM. Laugier and Richelot mention that an old soldier awoke with the sensation of a foreign body in his left eye, which was affected with pain, redness, and lacrymation. On reversing the upper eyelid, a small whitish point, like chalk, was observed on the surface of the conjunctiva, about three lines above the edge, and at a little distance from the temporal angle. With the point of a probe, it was felt immovable and hard. Some attempts were made to disengage it from the opening of one of the lacrymal ducts, where it seemed fixed, but in vain. The irritation was speedily subdued by soothing lotions. Two months afterwards the patient left the hospital, with the calculus still in its place, without any change in its bulk, or any renewal of uneasiness from its presence.[1]

Case 113. — Ann Clarke, aged 19, had been in a bad state of health for some months, and frequently complained of a severe pain in the head, particularly across the forehead, and over the left eye, for which she had been bled in the arm and had leeches applied to the temples, but without permanent relief.

On the 22d December 1834, inflammation came on suddenly in the left eye, attended with a good deal of pain; this increased on the following day, and towards the afternoon she felt a severe lancinating pain in the upper and outer part of the orbit, accompanied with a sudden and profuse discharge of tears; immediately after which she perceived something in her eye, which, on removing, she found to be a small hard body, resembling a fragment of mortar. At first she supposed it to be some extraneous substance which had accidentally fallen into her eye; but in the course of an hour, the pain, which had remitted on the removal of this mass, returned, and another exactly similar came away. During the three or four following days, as many as 23 were discharged, with the same symptoms; after which the pain and inflammation gradually abated. During the time that these bodies were escaping, there was no bleeding or purulent discharge. On the day following the removal of the last of them, there were slight appearances of conjunctival inflammation; but on everting the upper eyelid, no ulceration or other lesion of the mucous membrane could be perceived there, or on the other parts of the eye. She complained of slight tenderness or pressure in the situation of the lacrymal gland.

Some of the calculi, which had been preserved, were small, rough, very hard, and of a dirty white colour; the largest about a line in diameter. On being viewed with a microscope, they looked like rough pieces of chalk, with small portions of silex imbedded in them. On analysis, they were found to consist principally of phosphate of lime, with a small quantity of carbonate of lime, and traces of animal matter.

The narrator of the case thinks it probable that the calculi were lodged, in the first instance, in the lacrymal ducts, and that producing much irritation there, they were discharged with a gush of tears.[2]

Concretions, deposited from the tears, occur in the sinuses of the conjunctiva, in the caruncula lacrymalis, and in the excreting lacrymal passages, as I shall explain more fully in Chapters IV., V. and VI. Similar concretions are also met with in the Meibomian follicles.

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[1] Translation of this work into French; p. vi.; Paris, 1844.

[2] Medical Gazette; Vol. xv. p. 628; London, 1835.

CHAPTER III.

DISEASES OF THE EYEBROW AND EYELIDS.

SECTION I. — INJURIES OF THE EYEBROW AND EYELIDS.

Contusions, wounds, and burns of the eyebrow and eyelids, even in cases where they at first appear trifling, are often productive of serious effects. Lagophthalmos and ectropium are apt to be the consequences of neglected burns and abscesses of the eyelids; while incised and lacerated wounds of the eyebrow and of the neighbouring integuments, even of small extent, are often followed by asthenopia, and occasionally by complete, and too often incurable, amaurosis.

§ 1. *Contusion and Ecchymosis.*

Blows or falls upon the edge of the orbit, even when slight, are apt to produce extravasation of blood into the loose areolar tissue of the eyelids. The extravasation or ecchymosis seldom makes its appearance immediately after the blow. Five or six hours sometimes elapse before the swollen eyelid assumes the livid colour denoting the rupture of blood-vessels and subcutaneous effusion of blood. In other instances, however, the ecchymosis is sudden; and the quantity of blood being considerable, a degree of fluctuation is felt in the swollen lid. In pugilistic contests, the eyes are completely closed from the swollen and ecchymosed state of the lids; but the seconds make an opening in the skin with a lancet, and squeeze out the blood, so as to enable the combatant to see his way a little longer.[1] It sometimes happens, that also the subconjunctival areolar tissue is ecchymosed, and occasionally the effused blood stretches back into the orbit, and even protrudes the eyeball. It very rarely happens that the blood effused into the eyelids, operates as a foreign substance, or excites inflammation. In some cases, it is collected, as it were, in a cyst, and imitates the form and feeling of a tumour. I have seen such a spurious cyst extirpated. On laying it open, it contained nothing but water and blood. Had it been left, it might perhaps have degenerated into some sort of tumour.

Ecchymosis sometimes presents itself, not merely immediately around the part struck, but in other places more or less remote. Thus Ammon[2] relates a case of contusion with a foil in the vicinity of the right caruncula lacrymalis, with profuse ecchymosis, protrusion of the eyeball, and concussion of the brain. On the third day after the accident, an ecchymosis appeared on the left side, in the very situation, and to the same extent, as that on the right. He calls this a *sympathetic ecchymosis;* and could trace no communication from the right side to the left, over the nose or forehead. Some months after the injury, the right eye became amaurotic.

Ecchymosis (as mentioned p. 5) is sometimes symptomatic of counter-fracture of the walls of the orbit. In this case, the ecchymosis increases slowly for days, and is not attended by any considerable swelling. Symptomatic ecchymosis gradually reaches the eyelids, which become more and more discoloured; ecchymosis from direct injury extends, on the contrary, from the eyelids to the neighbouring parts.

Under ordinary circumstances, the blood in ecchymosis of the eyelids is absorbed in the course of two or three weeks, the swelling subsiding, and the skin gradually losing its livid colour as the absorption goes on, becoming first brownish, and then yellow.

In cases of bruise and ecchymosis of the eyelids, we must endeavour to prevent or abate inflammation, and promote absorption of the effused blood.

The first of these objects is to be obtained by the application of leeches, followed by the continued use of evaporating and slightly astringent lotions. More powerful astringents, and gentle pressure, are employed to accomplish the second.

To remove a *black eye,* as it is termed, quickly, is the great desideratum with the patient, who often visits us late in the evening, with a woful dread of what his appearance must be next morning, unless we have some application which can prevent or remove the discolouration.

If the blow has been severe, there can be no question that leeching is the proper mode of treatment. When the patient is a scrofulous child, the application of leeches is called for, not indeed so much for the removal of the ecchymosis, as for preventing inflammation of the periosteum and bones.

If the blow has been slight, and the patient is a robust adult, compresses wet with an evaporating lotion, may be applied, and kept in close contact with the skin, by means of a roller going round the head. Fomentations with warm water, or with hot spirits, are sometimes used, and appear to do good. A popular remedy is a cataplasm of the bruised roots of the convallaria multiflora or Solomon's seal. The roots are beat into a pultaceous mass in a mortar, and are re-applied every half hour for three or four hours, or longer if necessary. They cause a degree of redness and swelling, and have been supposed to act by means of the œdema which they excite, diluting the effused blood, and thus promoting its absorption. If long continued, they produce too much inflammation; and if the skin be abraded, they are too irritating to be applied at all.

Whatever application we make choice of, whether a solution of muriate of ammonia, a spirituous fomentation, or a cataplasm of convallaria roots, the patient ought to be directed to keep the eyelids at rest, and to maintain a certain degree of pressure on them by means of wet folds of linen, or the cataplasm. Motion of the lids appears to throw the effused blood more into their loose cellular substance, while rest, and gentle pressure tend both to prevent this, and to promote absorption.

By lancing an ecchymosis, more harm is done than would arise from allowing the blood to remain.

After the swelling has subsided, those who are obliged to appear in public, sometimes contrive to paint the skin from day to day, till the natural colour is restored.

§ 2. *Poisoned Wounds.*

The eyelids are apt to suffer from the stings of bees, wasps, gnats, &c. From the poisonous principle infused into the wound, the stings of those insects sometimes produce severe irritation and inflammation; and the effects are generally aggravated if the sting is left in the wound. If we allow ourselves without resistance to be stung by a wasp or a bee, the insect gradually disengages the sting, without breaking it. The sting is flexible, and the wound is curved or in a zigzag direction. If we drive the insect away, the sting is caught in the wound, breaks off, and is left behind.[3]

The result, if there is only one wound, is a circumscribed inflammatory, or erysipelatous swelling of the eyelid and eyebrow, sometimes ending in a small slough, sometimes in a considerable abscess, which points and breaks at the place of the sting. If there are many punctures, the reaction may extend beyond the seat of the injury. Rognetta refers[4], as to a well known fact, to the case of an unfortunate postilion, who having overturned a beehive by an accidental stroke of his whip, was so stung about the eyelids and rest of his face, that his head swelled prodigiously, fever with delirium ensued, and he died in a few days.

The treatment in ordinary cases consists in extracting the sting, and applying some refrigerant and astringent lotion, as vinegar and water, or a solution of muriate of ammonia.

Gillman has recorded[5] a case of bite of the eyebrow by a dog, followed by hydrophobia: and Lecheverel, one of bite of the upper eyelid, near the outer canthus, by a dog not mad, which also produced fatal hydrophobia.[6] A case of this sort is related by Mr. Haynes Walton[7], who does not hesitate to recommend the wounded part to be excised under such circumstances, not conceiving the alleged power of neutralizing the poison by escharotics worthy of confidence.

Case 114.—The whole integuments of the upper eyelid in a little boy who was brought to me, were destroyed by inflammation and sloughing, consequent to a scratch with the claw of a cat. I feared lest complete ectropium should be the result; but the wound healed very slowly, and the margin of the lid, having luckily escaped, seemed to prevent any eversion.

§ 3. *Burns and Scalds.*

Burns and scalds of the eyelids present many shades of severity, depending on the nature of the medium by which the heat is applied, the length of time during which the parts are exposed to its influence, and the extent and situation of the surface affected.

For example, in cases of exposure to common flame, the eyelids have time forcibly to close, so that only a very small portion of the eyelashes is left unprotected. Common flame, then, singes in general merely the ends of the eyelashes, and scarcely ever touches the eyeball.

When gunpowder takes fire, and burns the eyelids, the flame being so sudden and expansive, the lids do not close in time, and the eyelashes, along with the eyebrows, are generally completely burnt off, and often the conjunctiva, or the cornea, is also injured. When unconfined gunpowder takes fire, there is generally no propulsion of its particles, but grain after grain ignites and is consumed, burning of course the lids or any other part which is exposed. For the same reason, a rocket taking fire in the hand, burns the face and destroys the eyelashes and eyebrows, but leaves no grains imbedded in the skin, the conjunctiva, or the cornea; for the powder is previously ground and mixed with an additional quantity of charcoal. When confined, as in a flask, the grains of gunpowder, on the contrary, are driven about unexploded, and fix in the skin of the lids, in the conjunctiva, or in the cornea.[8]

Case 115.—A bit of a lighted cigar, falling on the inner extremity of the left lower lid, gave rise to a blister and ulcer, with much thickening of the lid and general chemosis of the conjunctiva. The swelling subsided and the sore healed slowly, under the application of cold water.

A person falling down in an epileptic fit, perhaps brings the eyelids into merely momentary contact with the ribs of the grate and burns them superficially; or, remaining insensible for a considerable time, and lying in contact with the fire, a large portion of the integuments of the face is disorganised, and that so deeply, that on the eschar separating, the bones are exposed.

All cases of burns and scalds of the eyelids should be treated with particular care; for, there is, on the one hand, the danger of anchyloblepharon, or union of the edges of the lids, and on the other, of lagophthalmos and ectropium.

If hot water, or some caustic fluid, is the offending cause, much will depend on the temperature of the former, and on the degree of concentration of the latter.

It is chiefly in cases of scalds from boiling water, and other hot or caustic fluids, as sulphuric acid, in which the cuticle covering the edges of the lids has been detached, and the patient afterwards allowed, from carelessness, to lie for a length of time with the lids shut, that anchyloblepharon follows. To prevent this, if possible, the patient should be obliged frequently to open his eyes, while a little mild salve, melted on the point of the finger, should be introduced along their edges. Symblepharon, or union of the lids to the eyeball, is sometimes produced, when the conjunctiva has been injured by the burn or scald. Its prevention should be attempted in a similar way.

Burns and scalds of the external surface of the lids, which have not been sufficiently severe to produce a separation of the cuticle, much less to destroy the texture of the cutis, require merely to be kept constantly wet with water for twenty-four hours, by means of a fold of linen. The same application is also, I conceive, the best, in cases in which the skin is blistered; only, that as soon as the blister has fairly formed, it ought to be punctured with a needle, to let its contents escape. After the first twenty-four hours, a piece of soft linen, spread with simple cerate, is to be applied.

Burns so severe as to destroy the texture of the cutis, heal only by a slow process of granulation and cicatrization. The granulations, upon which the new skin is formed, are afterwards absorbed, so that a great degree of contraction is produced; and if the eyelids are involved in the cicatrice, they are liable to be shortened or everted. This happens more frequently to the lower than to the upper lid, while in some cases of destruction of the skin stretching from the outer angle of the eye towards the temple, we find, after the burn has healed, that both lids are dragged outwards, and their internal surface exposed. One of the worst cases of eversion of the lids from a burn, which I have seen, was consequent to total destruction of a large portion of the skin of the face, occasioned by a child falling against the fire. The lobe of the ear was lost, the cicatrice was very extensive, and both lids were everted, and dragged towards the temple. In such a case, it is impossible to prevent altogether the displacement of the lids, attendant on the contraction of the cicatrice. In cases of burning of the eyelids from the individual falling upon the fire, where the destruction of parts is such that little else is left than cartilage and conjunctiva, the consequent ectropium is necessarily so great, that the eye inflames, suppurates, and perishes, from exposure. But, in ordinary and less severe cases, much may be done by careful dressing and bandaging. The lids must be kept, as much as possible, on the stretch, during the progress of cicatrization; for if this is not done, little or no new skin will be formed, but the ulcer will be covered at the expense of the loose integuments around, in the same way as an ulcer of the scrotum will sometimes heal up without almost any formation of new skin. The patient, then, in whom the cicatrization of a burn in the neighbourhood of the eyelids is going on, ought not to be allowed to use his eyes, but should keep the lids, both of the injured and of the sound side, constantly shut, except when the dressings are changed. Let pledgets, spread with simple cerate, be laid upon the parts, and round the head a roller applied so as to press gently on the lids, and keep them on the stretch. This will appear probably a very tedious and annoying mode of treatment. To be allowed to use the eyes, would be much more agreeable to the patient, till he found, as soon as the process of healing was finished, that he could only incompletely close his lids, or that a portion of their inner surface was permanently exposed by eversion.

Burns by gunpowder are to be treated in the same way as other burns, except when unexploded grains of the powder have been forced into the skin of the eyelids. When this is the case, the particles must be carefully picked out, one by one, with a cataract needle; an operation which may take hours to accomplish. Under such circumstances, we should not trust much to the application of a poultice, which is recommended with the view of dissolving and bringing away the grains of powder. If they are left in the skin, indelible spots remain as if the person were tatooed.

§ 4. *Incised and Lacerated Wounds.*

Punctured wounds of the eyebrow and eyelids are, in general, not attended by any bad consequences. We must be upon our guard, of course, lest a punctured wound of the upper lid has gone deeper than its mere external appearance might denote, and the instrument with which the wound was inflicted penetrated into the orbit, or through the orbitary plate of the frontal bone. (See page 6.) We must also examine carefully whether any portion of the instrument (the broken end of a stick, for example) may not have separated in the wound, and be lodged in the loose areolar tissue around the eyeball.

The edges of incised wounds of the eyebrow are to be brought accurately together, and retained by the interrupted suture, with slips of court-plaister between the stitches. Dieffenbach used the twisted suture in such cases, inserting fine insect pins, and twisting a thread round them. The same practice is to be followed in incised wounds of the eyelids. Even when they are parallel to the fibres of the orbicularis palpebrarum, and implicate only the integuments, we shall find the suture the best means of maintaining the edges of the wound in exact apposition, and thereby preventing any unsightly cicatrice. Stitches are still more necessary, where the whole thickness of the lid has been divided, either transversely or vertically. When the wound is transverse, we may content ourselves with including only the integuments in the suture; but in vertical wounds, the needle ought to pass through the whole thickness of the divided lid. After the stitches are inserted, and the slips of plaister applied, the eyelids are to be closed, and covered with a pledget spread with simple cerate. A folded piece of linen is to be laid over the sound eye, and a roller, going round the head, is to press gently upon both eyes, so as at once to keep the dressings in their place, and to restrain the lids from moving. Generally, by the third day, union is effected, so that the threads may be cut out, or the pins removed; after which, the slips of plaister are to be replaced, as well as the compresses and roller.

If the edges of a wound of the lids do not correspond, they must be made to do so by the application of the scissors. If a large piece of skin be lost, so that the edges of a transverse wound cannot be made to meet, subsequent ectropium may sometimes be prevented, by making an incision parallel to the wound, and about a quarter of an inch from its exterior edge, which will allow the edges of the wound to be drawn together. A vertical wound of either eyelid, passing through its whole thickness so as to divide it into two flaps, somewhat like the two portions of a hare-lip, has received the name of *coloboma*. If neglected, the edges of such a wound are apt to cicatrize separately. A similar deformity sometimes occurs congenitally.[9] An operation analogous to that for the cure of hare-lip, is to be had recourse to under such circumstances. The edges of the coloboma are to be pared, and then accurately brought into contact, and kept so by one or two sutures and slips of court plaster, till reunion is completed.

If a vertical wound of either eyelid is treated merely by the application of plaisters, without any suture, the one edge of the wound is apt to slip under the other, union is effected in this position, and the cilia of the flap which is undermost, are turned in on the eye. Should this have happened, the two flaps must be separated with the knife, and their edges, being pared with scissors, must be brought accurately together with a suture or two.

Case 116. — A little boy had the lower eyelid torn through, near the inner canthus, by the paw of a dog. He was carried into a surgeon's shop, and a piece of adhesive plaister put over the wound. Some days after, being called to see him, I found the flap rolled in, so that the cilia were out of sight. The adhesions were not yet so strong, but I could tear them asunder with a probe; after which I applied stitches, and a compress and roller.

It occasionally happens that, through a wound of either eyelid, the eyeball is injured. This does not alter the mode of proceeding with regard to the lid. So instantaneous is the instinctive shutting of the eye when approached by any foreign body, the eyeball rolling upwards and the lid at the same moment descending, that the wound of the lid and that of the ball will probably correspond, when the eye is closed; and the eye being kept in that state after the injury, symblepharon is not unlikely to take place. Mr. Lawrence mentions a case in which a horizontal wound of the upper lid having been neglected, a sort of button-hole was formed, from the edges not having been kept in apposition; what was worse, accretion of the conjunctival surface of the palpebra to the globe had taken place, and the lid hung so much over the globe as to render the eye almost useless.[10] On the 1st May, 1836, I saw a boy at the Glasgow Eye Infirmary, who had been wounded in the upper eyelid six weeks before, with a sharp piece of stoneware. The lid could not be raised from the eyeball so as to bring the cornea into view. There was evidently symblepharon, and probably the eyeball had been penetrated, at the time of the wound, as well as the eyelid.

Lacerated wounds of the eyebrow and eyelids do not so readily admit of union as incised wounds. The swelling, inflammation, and suppuration which ensue, prevent immediate union. Allowed to heal without particular care, the contraction during the progress of cicatrization, is apt to produce ectropium, against which we ought to guard by treating lacerated wounds of these parts almost exactly as we would do incised wounds. Having carefully cleaned them, and removed any foreign substances which may have been forced into the cellular membrane, we bring the edges accurately together. If the means employed to produce re-union, do not succeed, or if they seem to produce additional irritation, they must be removed, and the cure must be effected by the second intention. When the contusion and laceration attending a wounded eyelid are very great, of course no attempt at union need be made, till, by leeching, and poulticing with bread and water, the irritation and tumefaction shall have subsided. By guarding against motion, and by the careful use of compresses and adhesive plaisters after the parts have become quiet, we shall often be able to accomplish re-union without any considerable deformity or displacement.

Wounds of the lids from explosions often present a frightful appearance, and are apt to leave the parts in a very altered condition.

Case 117.—A gunsmith, employed to repair a musket, which he was told was not charged, put the breech of it in the fire, and looked in at the muzzle. A small charge of powder which was in it exploded, and tore his right upper eyelid through at its inner extremity, forming a deep fissure in the inner canthus, completely charring and blackening all the parts with powder, and, though the eyeball was left entire, burning the cornea and rendering it opaque.

Case 118. — Ammon[11] gives a figure of a boy, who was wounded by a musket ball, which passing from left to right, struck the face so that it tore away the left lower lid, destroyed the left eyeball, penetrated the arch of the nose, tore away the right lower lid, and burst the right eyeball. The eyes atrophied, and in place of the lower lids there was an exposed red mucous surface; the upper lids, being no longer connected at their extremities by any commissure, were slightly everted, and had lost their natural motion.

From lacerated wounds, gangrene and sloughing of the injured part may take place, and one or other lid may be destroyed.

Case 119. — A man calling to consult me regarding an affection of the lungs, I noticed something remarkable about one of his eyes, and on examination found the lower lid entirely wanting. The skin of the cheek ended abruptly in the conjunctiva oculi. The upper lid was elongated, so as to supply the deficiency. On inquiring into the history of the case, he told me that, several years before, he had received a severe injury of the lid with a reaping-hook, followed by such a degree of inflammation, probably gangrenous, as destroyed the lid entirely.

In lacerated wounds, the lids may be so much injured, that, after recovery, one or other of them, or both, shall be found adherent to the eyeball, and the patient scarcely able to expose any part of the eye. If the smallest chink, however, continues open, the eyeball will turn towards that point, and vision be thereby accomplished; as was the fact, no doubt, in the case related by Smetius[12] in which the lids seemed so altered, and so agglutinated to the eyeball, that when the patient began to discern objects, it was absurdly concluded that he saw, not from between the lids, but down the nose, which had also been severely injured, and remained more expanded than natural.

Incised, and, still more, lacerated wounds of the lids are apt to bring on erysipelas, which, by passing deep into the orbit, may affect the brain or its membranes and cause death, as I shall have occasion to state more fully in the Third Section of this Chapter.

Wounds of the upper eyelid are occasionally followed by palsy, in consequence of the injury done to the levator palpebræ superioris, or to the branch with which it is supplied by the third nerve. This branch, however, cannot be reached, unless the wound penetrates pretty deep into the orbit, and traverses the levator muscle. Paré observes[13] that the patient, when he wishes to see, is obliged to raise the eyelid with his finger. He attributes this consequence of a wound of the upper eyelid, to unskilfulness or inadvertence on the part of the surgeon, inasmuch as he must have omitted sewing the wound properly, and applying the necessary compresses and bandage. M. Ribes mentions the case of a soldier who had received a cut from a sabre in the upper eyelid, towards the superior edge of the tarsus. The wound healed readily: but the patient, even while he retained the faculty of vision, saw none, on account of the impossibility of raising the upper eyelid, which continued constantly depressed.[14] Such facts, while they must impress us with the importance of leaving nothing undone which is likely to procure a complete re-union of the divided parts, may serve also to warn us against pronouncing a prognosis too decidedly favourable, in those cases in which we have reason to suspect that the levator of the upper eyelid, or its nerve, may have been injured.

Wounds of the eyebrow and eyelids are sometimes followed by effects still more serious. I have already (page 2) quoted a case from Dease, and referred to another by Petit, in which injuries of this sort were followed by inflammation within the cranium, and death. Weakness of sight, or even loss of vision, is another consequence apparently arising from even trifling injuries of the eyebrows and eyelids, which has attracted much attention. For example, Camerarius relates the case of a young man who received a slight wound at the inner angle of the left eye close to the upper eyelid. The wound, though small, penetrated to the bone, and the patient immediately felt a severe pain, which was attended by swelling of the part, and by palsy of the right side of his body. The vision of the right eye became dim, and that of the left was totally lost, although nothing appeared diseased about the eye, except a slight dilatation of the pupil. The left upper eyelid was also paralysed. The use of hot mineral waters seemed to restore the motion of the lid, and also of the right leg and arm. The sight of the right eye was in some degree recovered, but that of the left was irremediably lost. Morgagni was consulted by a lady, who had been wounded close to the left eye, in two places, by the fragments of the glass of a carriage window. She had seen none during the four days which followed the accident. One of the wounds was near the outer angle, and the other, which was smaller, was under the commencement of the eyebrow. Sabatier quotes[15] these facts, as illustrative of the effects of injuries done to the branches of the fifth pair of nerves.

Petit having submitted to the French Academy of Surgery the case of an officer, who became completely amaurotic in consequence of a sword-wound in the eyebrow; some explained the fact by attributing it to the concussion of the brain, produced by the instrument of injury; others thought it probable that the sword had penetrated the orbit, and touched the brain; while a third party denied the fact altogether. In this state of the question, Vicq d'Azyr had recourse to experiment. He laid bare, in a variety of animals, the frontal and superciliary branches of the fifth pair; he bruised and tore the exposed nerves; and convinced himself that this was speedily followed by blindness.[16]

Sabatier, Beer, and others suppose, that the injury of the supra-orbitary nerve, or of some other of the branches of the fifth pair, operates sympathetically on the eye, through the medium of the nasal branch of that nerve, which assists in the formation of the lenticular ganglion. Admitting this supposition to be true, the question naturally arises, how an injury of the fifth pair, operating through the medium of the lenticular ganglion, should produce blindness. This point has been taken up by M. Ribes, who contends that the ciliary nerves do not all go to the iris; but that several of them, having reached the anterior part of the eye, penetrate the corpus ciliare, and send filaments back towards the retina.[17] Even such a connexion, were its truth established, would by no means explain how the irritation arising from an injury of a branch of the fifth nerve, could affect the retina, unless through the medium of the brain.

Beer has discussed the subject of amaurosis from wounds of the branches of the fifth nerve, at great length.[18] The substance of his observations is, that in severe cases the blindness may be instantaneous; in less severe cases, slow, sometimes not till after the process of cicatrization has begun, or is completed; that it may be a consequence of tension of the nerve, or pressure upon it produced by the cicatrice; that the pupil is sometimes expanded, sometimes contracted, in such cases; that we must beware of confounding amaurosis from wounds of the branches of the fifth pair, with amaurosis from concussion of the eyeball, and perhaps laceration of the retina, and bear in mind that, along with a wound of the eyebrow or eyelids, there may have been a severe blow on the eyeball; that in cases in which the amaurosis is really sympathetic, vision may often be completely restored by dividing the lacerated nerve.

Chopart[19], Boyer[20], and others have adopted a different view from that of Sabatier and Beer, upon the subject of amaurosis consequent to wounds of the eyebrow and eyelids. They have observed that blindness is not the only attendant on such injuries; but that convulsions, palsies, delirium, coma, and even death, have not unfrequently been known to result apparently from such wounds, but in fact from disease of the brain, either concomitant with, or produced by, the external injury. They have, therefore, concluded, that we ought not to account the amaurosis a mere nervous sympathetic effect, or a mere re-action from the injured nerve of the face, upon the nerves of the iris or retina; but that the irritation arising from the wound is propagated to the brain; that the nervous symptoms which follow, are to be ascribed to disease arising in that organ; and that the affection of the brain, or of its membranes, in such cases generally partakes of the nature of inflammation, followed by effusion, or by suppuration. In many cases of this sort, the result has been fatal, and dissection has demonstrated the truth of these views; while in cases of recovery, we should be led to suspect, that the amaurosis, and other nervous symptoms, have disappeared, not in consequence of our dividing the injured nerve, but from the diseased state of the brain having subsided.

The instances on record which show that very serious or even fatal disease of the brain, may arise in connexion with apparently slight wounds of the eyebrow or eyelids, are sufficiently numerous. Morgagni has narrated[21] several highly interesting cases of this sort. The conclusion to be drawn from such cases is evidently this, that we must watch the effects of such injuries, keep the patient quiet and on low diet, and have recourse freely to the use of blood-letting, if there appear the slightest symptoms of any affection of the brain or its membranes. Similar practice must be followed, if we have reason to conclude that the amaurosis concomitant with a wound of the eyebrow or eyelids is the result, not of the injury done to the branches of the fifth nerve, but of concussion of the eyeball. I have seen numerous examples of a blow on the eye inducing amaurosis, without in the least affecting the vascularity, or the transparency, of its different textures; and I can easily conceive that, had any wound of the integuments in the neighbourhood of the eye accompanied such blows, I might have been led into the erroneous supposition that the amaurosis was not direct, but sympathetic.

My own experience leads me to state, that a very considerable proportion of the subjects of asthenopia and of amaurosis present cicatrices of the eyebrow or its neighbourhood; and a suspicion naturally arises, when no other more likely cause is detected, that these affections of sight have originated in injuries of the branches of the fifth nerve. In some cases I have seen acute inflammation of the retina and iris excited by such injuries; much more frequently the affection, which has interfered with the nutrition of the eye and the soundness of the retina, has either been slow and insidious in its progress, or has established itself soon after the injury, but without being observed. In all such cases I should suspect that injury of the branches of the fifth nerve, having communicated irritation to the nervous centres, a reflex disease, probably inflammatory, was propagated from them to the optic nerve, and to the other nerves concerned in the function of vision. Such considerations would lead us, in cases of suspected injury of the branches of the fifth nerve, not only to enjoin rest, to treat the patient antiphlogistically, but to administer calomel, with opium, in doses sufficient to affect the system.

It is proper to mention, before quitting this subject, that the section of the injured nerve, proposed by Beer, and which he expressly states to be a means which had never failed him, has been repeated in several instances by others, without producing any effect upon the amaurosis. "I have met," says Dr. Hennen, "with one or two cases of amaurosis from wounds of the supra-orbitary nerve; the perfect division of the nerve produced no alleviation of the complaint, but after some time the eye partially recovered."[22] "When the defective vision follows a wound in the forehead," says Mr. Guthrie, "the only hope of relief that we are at present acquainted with, lies in a free incision made down to the bone, in the direction of the original wound; and even of the efficacy of this I am sorry I cannot offer testimony from my own practice, having failed in every case in which I tried it."[23]

Many other remedies deserve a trial, in cases of amaurosis apparently arising from injuries of the fifth pair, besides the operation here referred to. In a case recorded by Dr. Lichtenstädt, in which the amaurosis seems to have originated in a wound of the infra-orbitary nerve, made in opening a scrofulous abscess, electricity appeared singularly useful in restoring vision.[24]

It is well known, that every wound of the branches of the fifth pair does not produce amaurosis. In a case which fell under my observation, mydriasis rather than amaurosis was the effect of such an injury; for while with the naked eye the patient could not tell that a paper held before him was printed, when he looked through a pin-hole in a card, he could read even a small type. Magendie has even endeavoured to show by experiment that pricking the branches in question, especially the supra-orbitary, infra-orbitary, and lacrymal, has no bad effect on vision. He has been led to propose galvanizing the eye, by touching these nerves directly with the wires communicating with the opposite poles of a galvanic trough.[25] The consideration of these facts naturally leads us to regard with still greater doubt, the alleged occurrence of purely sympathetic amaurosis from slight injuries of the fifth pair, and to suspect that, in supposed cases of this sort there has been, in addition to the external injury, either concussion of the eyeball, or disease excited within the cranium.[26]

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[1] Lawrence's Treatise on the Diseases of the Eye, p 126; London, 1833.

[2] Zeitschrift für die Ophthalmologie; Vol. i. p. 125; Dresden, 1830.

[3] Reaumur, Histoire des Guêpes; Mémoires de l'Académie Royale des Sciences, 1719; p 350; Amsterdam, 1723.

[4] Cours public d'Ophthalmologie; Lancette Française, 7 Janvier, 1837.

[5] Dissertation on the Bite of a Rabid Animal, p 170; London, 1812.

[6] Quoted from Bulletin des Sciences Médicales; Tome ii.; Paris, 1808; in Langenbeck's Bibliothek; Vol. iii. p. 666; Göttingen, 1810.

[7] Operative Ophthalmic Surgery, p. 93; London, 1853.

[8] See Lonsdale, Medical Gazette; Vol. xi. p. 696; London, 1833.

[9] Das Auge, vom Professor Beer, p 55; Wien, 1813: Heyfelder, Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 481; Dresden, 1831.

[10] Op. cit. p. 127.

[11] Klinische Darstellungen der Krankheiten des Auges; Zweiter Theil; Taf. vi. fig. 17; Berlin, 1838.

[12] Trnka de Kržowitz, Historia Amauroseos, p. 16; Vindobonæ, 1781.

[13] Œuvres; Liv. x. Chap. 24.

[14] Mémoires de la Société Médicale d'Émulation; Vol. vii. p. 92; Paris, 1811.

[15] Traité d'Anatomie; Tome iii. p. 228 Paris, 1791.

[16] Journal Complémentaire des Sciences Médicales; Vol. xliv. p. 201; Paris, 1832.

[17] Mémoires de la Société Médicale d'Émulation; Tome vii. p. 99; Paris, 1811.

[18] Lehre von den Augenkrankheiten; Vol. i. pp. 176, 185, 189; Wien, 1813.

[19] Treatise on Chirurgical Diseases,

translated by Turnbull; Vol. i. p. 267; London, 1797.

[20] Traité des Maladies Chirurgicales; Tome v. pp. 245, 248; Paris, 1816.

[21] De Sedibus et Causis Morborum, Lib. iv. Epist. 51; Tom. iii. p. 59; Ebroduni 1779. See a case in Bright's Reports; Vol. ii. Part i. p. 143; London, 1831.

[22] Observations on some Important Points in Military Surgery, p. 366; Edinburgh, 1818.

[23] Lectures on the Operative Surgery of the Eye, p. 102; London, 1823.

[24] Gräfe und Walther's Journal der Chirugie und Augenheilkunde; Vol. vi. p. 569; Berlin, 1824.

[25] Journal de Physiologie; Tome vi. p. 156; Paris, 1826.

[26] On amaurosis from wounds of the eyebrow, consult Walther, Gräfe und Walther's Journal der Chirurgie und Augenheikunde; Vol. xxix. p. 505; Berlin, 1840.

SECTION II. — PHLEGMONOUS INFLAMMATION OF THE EYELIDS.

Syn. — Blepharitis phlegmonosa.

Phlegmonous inflammation of the eyelids occurs more frequently in children than in adults, and oftener in the upper than in the lower lid.

Symptoms. The affected lid is of a deep red colour, hot, swollen, and very painful on being touched. The swelling spreads from the edge of the lid, but is generally limited in its progress by the margin of the orbit. It is soon so considerable as to prevent the eye from being opened; the pain is much increased by the least attempt to move the eye. If the inflammation is unchecked, the pain becomes pulsative, the swelling increases, assumes a livid red colour, and begins to point, generally about the middle of the lid. The pain is now attended by a pricking sensation. The hardness of the swelling diminishes, and at its most prominent part it becomes less sensitive to the touch. The lid has suppurated, the fluctuation of the matter is now distinct, and by and by the abscess bursts through the integuments. In some cases the abscess gives way on the inside of the lid.

Causes. Abrasion, and other injuries of the skin covering the eyelids, appear to bring on phlegmonous inflammation; but not unfrequently the cause is obscure, especially when children are the subjects.

Prognosis. This disease being neglected or mistreated, a portion of the integuments of the eyelids may be lost, from ulceration, or from the inflammation going on to gangrene; the consequence will be contraction of the lid, and perhaps ectropium.

Treatment. Leeches to the swollen lid, followed by the constant application of an evaporating lotion, constitute the local treatment during the first or purely inflammatory stage. The patient is also to be purged, to keep at rest, and live low. If these means are found insufficient to procure the resolution of the inflammation, a warm bread and water poultice is to be applied in a linen bag, and as soon as fluctuation is distinct, the abscess is to be opened with the lancet, the incision being made transversely, or parallel to the natural folds of the skin of the eyelids. The matter is generally found immediately under the skin. The poultice is to be continued till the swelling subsides, and the abscess ceases discharging.

SECTION III.—ERYSIPELATOUS INFLAMMATION OF THE EYELIDS.

Syn.—Blepharitis Erysipelatosa.—Diffuse cellular inflammation of the eyelids.

Fig. Dalrymple, Pl. VII. *fig.* 3.

In erysipelas of the face, vulgarly styled *the rose*, the eyelids are much affected, especially the upper. Erysipelas may also arise in the eyelids, and be confined to one or other of them, or affect both. In general, one side of the face only is affected; but sometimes both at once, or first the one, and then the other. The disease is very variable in severity. Affecting the eyelids, without tumour or vesication, and assuming a chronic course, it is styled *erythema.*

Local Symptoms. In erysipelas, the lids are much swollen, so that the eye is shut up. The swelling is of a pale red colour, but sometimes of a bright scarlet, or even of a deep and livid red. The redness disappears on pressure, but instantly returns when the pressure is removed. The pain is in general not considerable, nor pulsative. The swelling feels hot, and the patient complains of a stinging and burning sensation in the part. A serous effusion frequently takes place under the cuticle, which becomes elevated in vesicles. These bursting, allow the fluid they contain to escape and form crusts. On these falling off, the skin is generally left in a sound state; and the swelling subsiding, the eyelids recover their power of motion.

In more severe cases, the inflammation runs on into suppuration and sloughing of the subcutaneous cellular membrane. In such cases, the redness has more of the livid hue, the swelling is more considerable, and soon becomes tense and firm, the sensation of heat and pain is much aggravated, and is attended by throbbing. At first, the areolar tissue contains a whey-like serum. Mr. Lawrence mentions his having seen this effusion into the eyelids, almost of milky whiteness. It gradually becomes yellow and purulent, and is diffused through the swollen cellular membrane, which becomes so disorganized, that it comes away, after the abscess bursts or is opened, in shreds soaked with matter. An erysipelatous abscess differs from a phlegmonous one in this respect, that it is not bounded by a sphere of adhesive inflammation, but extends irregularly in different directions, producing extensive sloughing of the cellular membrane. An abscess of this sort communicates a peculiar boggy impression to the finger. If neglected, suppuration may take place as well beneath as exterior to the orbicularis palpebrarum, and even destroy the ligamentous layer of the eyelids. At length, the integuments give way in one or more points, a small quantity of matter is discharged, and shreds of disorganized cellular membrane may be extracted. Left, in this way, to run its course, severe erysipelas leaves the lids so altered, and their several textures so agglutinated from the loss of the connecting cellular membrane, that they are long before they recover, if ever they recover, their natural pliancy and mobility.

The conjunctiva, Meibomian follicles, and excreting lacrymal organs, always suffer more or less in erysipelas of the eyelids. A puro-mucous secretion accumulates, during the night, along the edges of the lids, and in the nasal angle of the eye. From this symptom, the inexperienced practitioner, called to an advanced case of erysipelas of the lids, is apt to suppose, that it is one of contagious ophthalmia. The absorption of the tears is impeded, and there is a slight accumulation of mucus in the lacrymal sac. In some cases, a stillicidium lacrymarum remains after all the other symptoms have disappeared. In severe cases, ending in diffuse suppuration, the matter occasionally penetrates into contact with the lacrymal sac, which is already distended by the presence of an inordinate quantity of mucus. After the integuments in such a case give way, a superficial observer may be deceived by the appearance of the parts. He probably pronounces the case to be a fistula of the lacrymal sac, and forthwith opens the sac. It may happen, however, that the purulent matter of an erysipelatous abscess actually makes its way into the lacrymal sac, which thus comes to be filled with pus received from without, in the production of which its lining membrane has had no share. The latter case, which, for the sake of distinction, may be called *spurious fistula* of the lacrymal sac, must be carefully distinguished both from the former, in which the sac is entire though distended with mucus, and from those diseases hereafter to be described, in which the purulent matter which fills the sac, is the result of inflammation of the lining membrane of that cavity itself. The sac, and the lacrymal canals, may suffer so much by being involved in the erysipelatous abscess, as to be rendered ever afterwards unfit to execute their functions.

Erysipelatous inflammation, spreading from the eyelids to the cellular membrane of the orbit, sometimes terminates in abscess within that cavity, or effusion of matter within the orbital capsule. This appears to be one of the modes, perhaps the most frequent but least suspected mode, in which erysipelas of the face or scalp proves fatal. The fatal result, under such circumstances, is generally ascribed to effusion within the head, but may happen without any inflammatory affection of the membranes or substance of the brain being detected after death. In such cases the formation of matter within the orbit sometimes takes place suddenly, at other times slowly and insidiously. The matter is often found deposited in small quantities in different parts of the orbit.

Numerous cases similar to the following one, are recorded by M. Piorry:—

Case 120.—A woman, aged 60, who had been admitted into the Salpétrière, on account of slight bronchitis, was seized with erysipelas, commencing on the right cheek, and affecting chiefly the region of the lacrymal sac. The redness extended to the eyelids, which became so much swollen as to close the eye. The disease spread to the other parts of the face and to the opposite eye. The part first affected ceased on the fourth day to be elastic, and became doughy. The general health was not at first affected; but the pulse rose as the disease made progress, and on the third day, stupor, coma, and delirium were added to the other symptoms. The hairy scalp was scarcely affected.

The disease was not at first regarded as one of serious import. An abstemious diet, and some simple lotion, made up the treatment. When the symptoms grew more severe, and the much-swollen eyelids became covered with vesicles, numerous leeches were employed, and derivatives applied to the lower extremities. These means proved fruitless, and the patient died on the fifth day.

On inspection, 24 hours after death, the skin, which had been so very red during life, was every where of the same colour as that of the other parts of the body. It was scarcely at all thickened. Pus was found in two small abscesses, about the size of a pea, in the cellular substance of the right cheek, close to the periosteum; and another small abscess, not communicating with the former, was situated over the nasal duct. The eyelids presented pus in their cellular tissue. On removing the roof of the right orbit, small depositions of pus were found in the fatty cellular membrane around the optic nerve, and in that covering the floor of the orbit, chiefly towards its inner wall. There was no large abscess, neither did the small depositions of pus communicate with one another. With the exception of the cellular tissue, none of the parts within the orbit appeared inflamed; but the same was the case with the skin, although during life it had presented a crimson colour. The left orbit contained no pus; nor was there any abscess in or under the scalp. The brain presented no inflammatory nor other diseased appearances. The lungs had suffered from pneumonia. The stomach, otherwise healthy, contained a quantity of greenish and apparently bilious fluid. The intestines were sound.[1]

It sometimes happens that the cellular membrane of the orbit, although considerably affected by inflammatory œdema, does not suppurate. On the subsiding of the acute symptoms, the eyeball in such cases may be found deprived of its power of motion, protruded, or even amaurotic from the pressure it has undergone.

Case 121. — In a case which came under my notice, and which had been attended with suppuration of both upper and lower lids, the lids having been long kept closed, and the conjunctiva much inflamed, union took place between the upper lid and the lower edge of the cornea, ulceration of the latter having no doubt preceded this symblepharon. The probe was readily passed around the point of union, and the adhesion was divided so as to restore to the lid its natural motion. The centre of the cornea was found to be clear, the pupil natural in size, but motionless, and the retina insensible.

Constitutional symptoms. Erysipelas of the eyelids is generally preceded by rigors, and attended by a considerable febrile irritation. The tongue is loaded, and the digestive organs much deranged. In fatal cases, death is preceded by delirium, subsultus tendinum, and coma.

Causes. As this disease frequently arises suddenly, without any local injury, it probably owes it origin to some peculiar state of the atmosphere, or to contagion, It is certainly much more apt to attack those whose stomach and bowels are in bad order. Local causes, as slight injuries, stings from wasps and other insects, leech-bites, incised or lacerated wounds of the eyelids, cuts and other injuries of the scalp, the application of blisters on the head, exposure of the eyes suddenly to cold after long-continued weeping, and the like, serve to produce it.

Treatment. An emeto-cathartic is the best of all general remedies to begin with, in erysipelas; for example, one or two grains of tartras antimonii, with an ounce or two of sulphas magnesiæ, dissolved in two pints of water, and a tea-cupful given every two hours. In robust subjects, blood-letting may be practised with good effect; but in aged or debilitated patients, this remedy can scarcely be ventured on. Leeches may be applied on the temple or behind the ear. After the stomach and bowels have been freely evacuated, gentle diaphoretics are to be employed. The patient must be put on low diet.

A prejudice exists among the vulgar, against every sort of wet application in erysipelas; but I have witnessed much advantage from the use of evaporating lotions in this complaint, and have never seen them do harm. The part affected may be sponged with spirits of wine, or kept wet with vinegar and water.

A solution of nitrate of silver, in the proportion of 4 grains to 1 ounce of distilled water, dropped once or twice a day upon the conjunctiva, represses the inordinate secretion of mucus.

We seldom require to touch the eyelids, when affected with erysipelas, with the lancet. Cases, however, do occur, in which scarifications, or even pretty deep incisions, ought to be employed.

Sir Richard Dobson's mode of scarification consists in making fine punctures, with the point of a lancet, over the whole inflamed part, in number from 10 to 50; then fomenting with warm water in a sponge, to encourage the bleeding and serous discharge; and repeating this operation two or three times in 24 hours, if the parts look red and tense. If done early, it shortens the disease; at all events, it relieves the vessels in a very remarkable degree, thus producing local benefit, while it also serves to check the severity of the cerebral and general symptoms. It prevents vesication, and what is more important, diminishes the chance of suppuration. Provided the punctures are very minute, and not lengthened into small incisions, they never leave any permanent marks, even on the smooth skin of the forehead, much less on the eyelids.[2] Dr. Bright relates[3] ten cases of erysipelas, treated by minute punctures. In most of them the lids were affected, and the practice appears to have been highly beneficial.

In severe cases threatening to go into suppuration, the treatment by incisions ought to be adopted. One or more transverse incisions through the skin and subcutaneous substance of the affected lid, if employed early, may prevent suppuration and sloughing; if later, it will afford the readiest outlet for the matter and disorganized cellular membrane. The incision is to be made cautiously, through the tissues of the lid, layer by layer, and is immediately to be followed by the application of a warm bread and water poultice.

The reader will find cases, serving to illustrate both the progress of the complaint, and the mode of treatment by incisions, related by Mr. Lawrence, in his valuable paper on the nature and treatment of erysipelas, in the 14th volume of the Medico-Chirurgical Transactions.

Should the symptoms in erysipelas of the lids lead us to suspect that the disease is tending inwards to the orbital cellular membrane, calomel, with opium, should be given, and blisters applied behind the ear, and to the temples. If the eyeball has become very prominent, and it seems probable that this is owing to the infiltration of pus into the cellular substance of the orbit, or a collection of fluid in the orbital capsule, the lancet should be employed to give the matter exit. The situation where matter is most frequently deposited, is between the eyeball and the floor of the orbit. Should no matter flow on making a deep incision, still the discharge of blood will probably prove servicable. The method of opening the orbital capsule is to divide the conjunctiva over the space between the rectus internus, and rectus inferior, as in the operation for strabismus, and then direct the lancet backwards by the side of the eyeball.

If a spurious fistula of the lacrymal sac has formed, it is to be washed out once a day with tepid water, mixed with a little of the vinous tincture of opium. A small quantity of lint dipped in the same tincture is then introduced into the abscess, but not pushed so deep as to enter the sac. After the fistula has healed, should *blenor-*

rhœa of the sac continue, it will require to be treated as explained in the Third Section of Chapter VI.

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[1] Piorry, Clinique Médicale de l'Hôpital de la Pitié et de l'Hospice de la Salpêtrière, en 1832, p. 381; Paris, 1833.

[2] Medico-Chirurgical Transactions; Vol. xiv. p 206; London, 1828.

[3] Reports of Medical Cases; Vol. ii. p. 98; London, 1831.

SECTION IV. — PHLEBITIS OF THE EYELIDS.

Syn. — Blepharitis phlebitica.

Case 122. — A man of 78 years of age was admitted into the Hôtel-Dieu at Nantz, with erysipelatous swelling of the face and eyelids. He had a quick pulse, pain in his forehead, and great thirst. General blood-letting, an abstemious diet, and diluents were employed. The œdematous state of the eyelids increased, and spread to the ocular conjunctiva. A considerable œdematous swelling was also observed in the right parotid region. The tension and redness abated considerably, but the pulse continued quick, the patient talked much, became delirious, and was affected with tremors of the limbs. He died with distinct symptoms of an affection of the brain.

On dissection, a circumstance attracted notice, which had not been observed during life; the veins of the forehead and temples felt hard, as if distended by an artificial injection. The scalp was swollen, especially posteriorly; and presented, towards the crown of the head, and on the left side of the sagittal suture, a small superficial ulcer, which the patient had not mentioned, so that, although probably the cause of all the symptoms, it had not been known during the life of the patient.

The two frontal veins, and their ramifications, extending to the crown of the head, were full of pus, either concrete or sanious. At several places it was difficult to separate the viscid ropy pus from the lining membrane of the veins. The palpebral branches, which anastomose with those two trunks, were injected with purulent matter more or less solid. This state was more remarkable on the left side. The infra-orbitary branches of the anterior frontal vein of that side were in the same state, and an incision of the eyelid and cheek disclosed a multitude of veins, superficial or deep-seated, filled with purulent clots or with a reddish sanies. The two temporal branches, and their ramifications, even the most deep-seated, the anterior and posterior auriculars, and the ramifications by which they originate in the cranium, were in the same state on the right side only. An incision of the subcutaneous cellular tissue and of the muscles of that region presented the same appearance as the cheek, only still more distinctly. A track of greenish viscid pus marked the course of all those vessels, the coats of which were in some places entire; in others destroyed. The venous anastomoses, external to the parotid, formed a network, which might be compared to a varicose tumour, in a state of suppuration. The external jugular vein contained a black adherent clot, a little softened in its centre. Its internal surface was of a deep red, and evidently injected. It was not permeable to the blood, except towards its lower part. The internal jugular vein was healthy and empty. The right ophthalmic vein was diseased, and a venous abscess existed at the very point where it leaves the orbit to enter the cavernous sinus. The disease terminated suddenly at this place, being bounded towards the cranium by a clot shutting up the vein. The sinuses of the brain did not participate in the disease. The arachnoid was somewhat opaque, especially on the left side and at the anterior part of the brain. There was considerable serous infiltration under the arachnoid; with a little water in the ventricles. In none of the organs of the body was pus detected, except in the veins already mentioned. The liver was not examined.[1]

This case demonstrates the necessity, when erysipelatous swelling attacks the eyelids, of examining the scalp and of attending to the state of the veins of the face. It also shows that too much dependence must not be placed upon an apparent diminution of the external symptoms; for in this instance the tension and redness fell, notwithstanding the impeded and disorganized state of a considerable portion of the venous system, and the close approach of death. These cautions are confirmed by a case of phlebitis related by Dr. Silvester[2];

in which the disease spread from the upper lip, along the sides of the nose, to the eyelids, forehead, and vertex, and proved fatal two months after the first appearance of the symptoms.

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[1] Archives Générales de Médecine ; Mai, 1837 ; p. 63.

[2] Medico-chirurgical Transactions ; Vol. xxiv. p. 36 ; London, 1841.

SECTION V.—CARBUNCLE OF THE EYELIDS.

Syn.— Anthrax Palpebrarum.

This circumscribed, gangrenous inflammation of the areolar tissue is occasionally met with in the eyelids. The swelling is of a dark red or purple colour, extremely hard, and attended by severe burning pain. Vesicles rise on its surface, occasioning intolerable itching. Ichorous matter is discharged, and the affected areolar tissue and skin, becoming black and sloughy, at length fall out. The cavity left by the separation of the slough granulates and heals up.

Carbuncle occurs principally in old persons, whose constitutions have suffered from irregularities in diet.

Opium to relieve the pain, bark and wine to support the strength, laxatives, and gentle diaphoretics, make up the general treatment.

An early and free incision into the tumour most effectually relieves the pain, allows the matter to escape, and promotes the separation of the slough. An emollient poultice is to be applied after the incision has been made, and continued till the cavity left by the slough has filled up by granulation. The sore is then to be dressed with simple cerate.

SECTION VI.—MALIGNANT PUSTULE OF THE EYELIDS.

Syn.— Die schwarze Pocke, *Ger.*

The disease long known in France by the name of *pustule maligne*, is a gangrenous inflammation of the skin, characterized at its commencement by a vesicle filled with bloody serum, under which there forms a small lenticular induration, which, in its turn, soon becomes surrounded by an erysipelato-phlegmonous tumefaction, of a deep red colour and glistening surface. Gangrene seizes the tumour, and extends rapidly from its centre to its circumference. This disease would appear in by far the greater number of cases to be produced from contact with one or other of the lower animals, affected in a similar way, or from contact with their carcases. It is sometimes communicated from one human being to another. It occurs chiefly in farriers, shepherds, butchers, tanners, and others occupied much with the lower animals or their remains; attacking those parts of the body which are habitually exposed, as the face, the hands, the arms, or such as have been accidentally exposed; and has been more frequently met with during the existence of epidemic diseases of the carbunculous description among cattle than at other times. The bloody serum of the pustule is the means by which the disease is propagated. Its progress in individual cases is rapid, and the result often fatal. Death has been known to occur in 24 hours after the person was attacked.

Malignant pustule is said to be rare in Paris; but common in Burgundy, Franche-Comté, and Lorraine. I am not acquainted with any account of this disease as observed in Great Britain. It cannot be denied that the cases published[1] under the name of *glanders in the human subject*, bear, in some respects, a similarity to those of malignant pustule; but, in glanders, a constitutional affection, somewhat like rheumatism, precedes the characteristic local symptoms, while the contrary is the case in malignant pustule. The latter disease displays itself from the commencement, by gangrenous inflammation at the point inoculated; but the former, only after serious derangement of the general health, exhibits a pustular and gangrenous affection of the skin, along with an eruption on the Schneiderian membrane, and a discharge of purulent matter from the nostrils. These last symptoms do not occur in malignant pustule.[2]

When malignant pustule attacks the face, the erysipelato-phlegmonous inflammation spreads to the neck, and even to the chest. When the eyelids are the seat of the disease, the face becomes enormously swollen and excessively pained. The patient is affected with deep-seated headache, attended by delirium. This is followed by stupor, and great prostration of strength. If he survives the separation of the portion which has become gangrenous, the lids are left in such a state of disorganization, that they consist of little more than conjunctiva. The consequence is, that as the process of recovery takes place, they are so greatly everted, that the eye is lost from want of its natural protection.

The local treatment most recommended is a crucial incision of the tumefied part, immediately followed by the application of the actual or potential cautery.

Internally, gentle stimulants and tonics appear to be most worthy of confidence.[3]

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[1] Brown, Medical Gazette; Vol. iv. p. 134; London, 1829: Elliotson, Medico-Chirurgical Transactions; Vol. xvi. p. 170; London, 1830; and Vol. xviii. p. 201; London, 1833: Williams' Elements of Medicine; Vol. ii. p. 381; London, 1841: Dublin Quarterly Journal of Medical Science; Vol viii. p. 442; Dublin, 1849.

[2] Rayer, Mémoires de l'Académie Royale de Médecine; Tome vi. p. 733; Paris, 1837.

[3] Morand, Mémoires de l'Académie Royale des Sciences, pour 1766: Enaux et Chaussier, Méthode de traiter les Morsures des Animaux enragés, suivie d'un Précis sur la Pustule Maligne; Dijon, 1785: Davy La Chevrie, Dissertation sur la Pustule Maligne de Bourgogne; Paris, 1807: Basedow, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. vii. p. 184; Berlin, 1825: Rayer, Traité des Maladies de la Peau; Vol. ii. p 71; Paris, 1827. At p. 613 of the same volume, a fatal case is detailed at great length.

SECTION VII. — SYPHILITIC ULCERATION OF THE EYELIDS.

Syn.—Blepharitis syphilitica.

Fig. Dalrymple. Pl. V. *figs.* 3, 4. Pl. VI. *fig.* 5.

That the eyelids are not unfrequently the seat of syphilitic inflammation, is a conclusion to which I have arrived from witnessing numerous cases of this sort. Some of them were suspected to be primary; the greater number were secondary.

When we see an adult affected with an ulcer on one eyelid only, which has continued for weeks, or it may be months, and has not yielded to local applications, but has rather grown worse, we should suspect syphilis. I have more than once seen syphilitic inflammation of the edge of an eyelid mistaken for simple ophthalmia tarsi; a mistake which may produce disastrous consequences. A similar caution applies to inflammation and ulceration near the inner canthus; for syphilitic ulceration, in this situation, is sometimes taken for dacryocystitis.

It is sometimes difficult to distinguish at first sight, a syphilitic from a cancerous ulcer of the eyelid. In syphilis, the skin is more swollen, and of a darker colour, than in cancer. In cancer, the edges of the ulcer are harder and more elevated, than in syphilis. The surrounding integuments are more glued down to the subjacent parts, and the surface of the sore not so foul. The sore is also studded with roundish whitish tubercles, over which creep varicose vessels, appearances which are not present in syphilis.

Case 123.—An old man, a patient at the Glasgow Eye Infirmary, acknowledged having been treated, some time before, for a primary affection; else I should have probably experienced some difficulty in deciding respecting the nature of the case The lid was much swollen and everted, its conjunctiva greatly inflamed, and on the external surface of the lid there was a deep ulcer, painful, and spreading towards the inner canthus. The skin round the ulcer was of a dark red colour. I ordered him two grains of calomel and one of opium, night and morning. He returned in five days, with another smaller ulcer near the punctum lacrymale of the same lid. The conjunctiva, covering the inner edge of the cornea, was also in a state of ulceration. The first ulcer of the lid was extending upwards and inwards, but at other parts its edge appeared inclined to cicatrize. The ulcer of the cornea was touched with the lunar caustic solution, and a carrot poultice ordered to the lid. Nine days after this, the eversion and thickening of the lid had become considerably less; the first ulcer had coalesced with that near the punctum, but was granulating and filling up. Soon after this the mouth became sore, and the ulcer contracted and healed. The mercury was stopped and resumed according to the state of the mouth, and a decoction of elm bark was given. As the lid continued to be everted after the ulcer had cicatrized, the thickened and inflamed conjunctiva was scarified, and the red precipitate salve was applied every evening; after which the lid completely resumed its place, scarcely any deformity being caused by the cicatrice, and no opacity left on the cornea.

Case 124.—A boy, of 7 years of age, was brought to me with a foul sore occupying a great part of the right lower lid. He had been under the care of a practitioner, who treated the case as one of fistula of the lacrymal sac, and thrust a probe through the ulcer in the direction of the nasal duct. This made the ulcer much worse. At first I adopted the idea that it was a scrofulous sore; but in a few days, finding it to increase rather than contract under mild dressings, and the internal use of sulphate of quina, I began to suspect a syphilitic taint; and on examining the throat, a foul ulcer was discovered on the velum. I gave the patient calomel and opium, under the influence of which the ulcer speedily contracted, and healed with considerable eversion. How the child had become affected with syphilis, appeared at first quite inexplicable; but at last it came out that he had been sleeping for some time in the same bed with a person labouring under primary symptoms of that disease.

Case 125.—J. S. aged 20 years, was admitted under my care, at the Glasgow Eye Infirmary, on the 28th September, 1838. He was born with a congenital deficiency of the upper part of the prepuce, while the opening of the urethra was not through the glans penis, but close behind it. He had a chancre on the glans, a second on the malformed prepuce, two syphilitic sores on the scrotum, and a suspicious-looking superficial ulcer on the right leg. He dated these sores from the month of May. Ten weeks before his admission, a small hard swelling formed on the middle of the right upper eyelid, which he supposed to be a stye. When he applied at the Infirmary, the whole of the eyelid was much inflamed, and rather of a livid colour. It felt hard and tuberculated, and was a good deal swollen. Along its margin, to about two-thirds of its extent, it was in a state of ulceration, and presented a considerable notch just about the middle. The internal surface was much inflamed, the conjunctiva being thickened, and discharging a considerable quantity of puriform mucus. He constantly held a handkerchief to the eye, to relieve the burning pain of the ulcer. His right cornea was nebulous, which he attributed partly to ophthalmia in childhood. Pulse 108, small. Occasional rigors. He complained of weakness. He had used no mercury.

The appearances in this patient were very characteristic. The general swelling of the whole eyelid, the hard nodulated surface of the swelling, the livid colour, the spreading of the ulcer along the edge, which at one point it had notched by a complete loss of substance, extending even to the cartilage, and the severe pain felt in the part, were all well marked, so that before asking any questions about the patient's previous health, the syphilitic nature of the case was forced upon my consideration. The patient gave a very confused account of the rise and progress of his ailment; but there could be little doubt of the secondary nature of the ulcer of the eyelid. All the sores speedily healed under the influence of calomel and opium.

Syphilitic ulceration of the eyelids generally occurs either on the edge, going on to destroy at once the skin, cartilage, and conjunctiva; or on the integuments, proceeding rapidly to form a deep and foul excavation.

Case 126.—In a girl, aged 11 years, who came under my care at the Glasgow Eye Infirmary, 6th September 1850, the disease had gone on for 6 months, and been treated as scrofulous. It had commenced over the left lacrymal sac, and at her admission presented a deep foul ulcer in the line of junction of the lower lid with the cheek, while another ulcer, ¾ inch long, occupied the space between the eyebrow and the upper lid. She was speedily brought under mercury, there being every reason to think that, had this not been done, the left lids would have been completely destroyed. The ulcer soon improved in appearance, and ultimately healed, leaving some degree of lagophthalmos.

If near the inner canthus, the ulcer is apt to penetrate into the lacrymal sac. It would appear that sometimes the ulcer commences on the inside of the lid, spreading over a considerable extent of the conjunctiva. Mr. Lawrence mentions his having seen instances, in which foul syphilitic ulcers spread over the whole of the inner surface of the upper lid, without appearing externally. In one case, the sore, he believes, would not have been discovered, if he had not been directing his attention some time before to the subject, so that he was led to evert the eyelid, when he discovered a syphilitic ulcer as large as a sixpence.[1]

In one case only, have I seen a syphilitic ulcer occupying the inner surface of the eyelid. On placing my finger on the upper lid externally, I felt as if a hard knot was situated internally, and a purulent discharge flowed at the same time from the upper sinus of the conjunctiva. I everted the lid and found a foul deep ulcer on its inner surface. I touched it repeatedly with lunar caustic, and it healed under mercury.

I remember M. Cullerier mentioning in his lectures at the *Hôpital des Vénériens*, that chancres of the eyelids were sometimes brought on by a kiss from an infected person, and in other cases, by the virus being conveyed on the finger. In one case which I treated, I was led to suspect that the disease had been directly conveyed in some such way to the eye; for, besides a deep ulcerated notch in the edge of the lower eyelid, there was a chancre on the conjunctiva oculi, close to the margin of the cornea. The pupil of the affected eye was small, and somewhat dragged towards the ulcer, but there was no iritis. The case did well under the use of mercury. A similar ulcer, however, of the conjunctiva oculi, only smaller, existed in the old man whose case I have related, and in whom the affection was secondary.

A case is narrated by Ricord[2], in which the finger of the patient had served to convey the virus from another person to his own eyelid, and in whom the pre-auricular and submaxillary glands seemed to have become infected.

Even when secondary, a syphilitic ulcer on the eyelid may be the only symptom of syphilis then manifest; but, in general, secondary sores on the eyelids are attended by other secondary symptoms, particularly by ulcerations of the throat, and eruptions on the skin.

In one case, I saw a syphilitic ulcer on the edge of the eyelid become covered with an elevated conical scab, such as is presented in rupia prominens.

Both the primary and the secondary cases are most effectually relieved by the use of mercury. Either to mistake the nature of the ulceration, or to trifle with it in the non-mercurial way, would be to expose the patient to the loss of the affected lid, and even of the eye. Once healed, the ulcer is very apt to return, if the mercurial course is prematurely abandoned. In the case of rupia, the internal use of iodide of potassium proved of great service, along with mercurial external applications.

The following case, related by Sir Charles Bell, is interesting on several accounts:—

Case 127.—A man presented himself in the hospital, with a squint, the left eye being distorted from the object. On the upper eyelid of the right eye, there was a deep venereal ulcer. The man was in danger of losing that eye, and required prompt assistance; but before he could be brought under the influence of mercury, the sore became deeper, and the cornea opaque. The superior rectus muscle being injured by the increasing depth of the sore, the pupil became permanently depressed. The sight of the right eye being now lost, the left eye came into use; it was directed with precision to objects, he had no difficulty in using it, and it daily became stronger.

After a few weeks, medicine having had its influence, the sore on the right upper eyelid healed, the inflammation of the eye and opacity of the cornea gradually diminished, and the light again became visible to this eye, first yellow, and then of a deep purple. The muscles now resumed their influence, and the right eye was restored to parallel motion with the left, so as considerably to embarrass vision. But the inflammation of the upper eyelid had been so great, as to diminish its mobility; and what appeared remarkable, the lower eyelid assumed the office of the upper, being depressed when the patient opened the eye, and elevated and drawn towards the nose when he attempted to close it. The upper eyelid was not only stiff, but diminished in breadth; so that, notwithstanding the remarkable elevation of the lower lid, their margins could not be brought together, and the motion of the eyeball could be seen. On the patient's attempting to close the eye, the pupil was always elevated, and the white of the eye exposed.[3]

Dr. Campbell has recorded a case, in which the upper and lower eyelids of the right side were wholly destroyed by syphilitic ulceration:—

Case 128.—Henry Muir, aged 28, was admitted into the Edinburgh Royal Infirmary, on the 17th December 1831, with his whole forehead covered with incrustations and cicatrices. Commencing at the left superciliary notch, and extending to the external angle of the right orbit, there was a lengthened depression, apparently the result of an exfoliation of the right superciliary ridge, and neighbouring portions of the os frontis. Both eyelids of the right side were completely gone, and the conjunctiva was found to be tightly stretched from the upper margin of the orbit, with which it was firmly connected, to the lower, being here continuous with the integuments of the cheek, as it was above with those of the forehead. The whole conjunctiva was thickened, and the portion to the inner side of the cornea was partly in a granulated state. The cornea was opaque, and appeared as if a thickened and somewhat corrugated membrane extended over it. Within the external angle of the os frontis, there was a small patch of red membrane, with some ulcerated points, through which a limpid fluid, like tears, sometimes copiously exuded. A considerable part of the conjunctiva appeared superficially ulcerated. No trace of the puncta lacrymalia could be discovered. With this eye the patient was sensible only of very strong light, as that produced by placing a lighted candle close to the eyeball. The eye moved in the orbit to a limited extent, its motions being retarded by the tense state of the conjunctiva.

The prepuce had been entirely destroyed by ulceration, leaving the glans penis uncovered. There was an ulcer, with undefined edges, encircling the root of the penis, and another on the lower side of the penis near the glans, where a small opening communicated with the urethra, and allowed a great part of the urine to escape. An ulcer of a similar character was also observed on the nates.

No satisfactory history could be obtained of the case. The ulcers were believed to be syphilitic, and the patient admitted that he had taken mercury to a considerable extent.

When the patient was admitted into the hospital, a considerable part of the sclerotic conjunctiva presented a raw surface; but after the use of an astringent lotion, it came to be covered with a thin film of new cuticle, excepting two very limited portions at the inner and outer angles of the eye. At two places, a little distant from each other, near the outer angle of the eye, and a little below the situation of the lacrymal gland, the tears were seen exuding from very minute and nearly invisible orifices, where they collected in globules, and whence they trickled down the cheek. At the inner canthus, there was sometimes seen resting upon the surface, a little clear fluid, which, it was conjectured, might come from the lacrymal sac, if this cavity was not obliterated. The patient suffered neither pain nor inconvenience from the exposed state of the eye.

The ulcers on the genitals, being in a chronic and indolent state, showed little disposition to take on a healthy action; but by putting the patient on a generous diet, and administering nitric acid internally, together with the local application of lunar caustic, followed by solutions of sulphate of copper and sulphate of zinc to the sores, these were brought into a healing state.[4]

In his remarks on the case Dr. Campbell observes, that in carcinomatous affections of the eyelids, requiring their removal, surgeons have directed the eyeball to be extirpated at the same time, in order to save the patient from the extreme degree of suffering which would otherwise arise from its constant exposure; but that the case shows a state of irritation not to be an invariable result of such exposure, since the patient experienced neither pain nor uneasiness, nor was likely to do so, the parts being covered and protected by the formation of a new cuticle over the surface left exposed by the loss of the eyelids.

This view of the matter is so far confirmed by the case of a pauper patient in this town, whom I had an opportunity of examining on the 13th September 1838, through the kindness of Dr. Jackson, under whose care she then was. I shall here embody the account, published[5] by Dr. Jackson, of this patient, with such additional notes as I took of her state. It must not be overlooked, however, that in cases such as those described by Dr. Campbell and Dr. Jackson, the eyeball would gradually accommodate itself to exposure, in proportion as the eyelids became destroyed. The irritation would necessarily be much greater, if these parts were removed at once by a surgical operation.

Case 129.—The patient is a widow of 60 years of age. The entire nose and nasal bones, a considerable portion of the ethmoid bone, and of the superior maxillary bones, the inferior turbinated bones, the vomer, and the whole hard and soft palate, have been destroyed by ulceration and exfoliation, so that the nostrils and mouth are converted into one opening, without any sort of division even in front. The opening is bounded above by the ethmoid bone, and below by the tongue; and is capable of admitting the 5 fingers. The alveolar processes of the upper and lower jaws have been completely removed. Over the centre of the frontal bone there is a large depression, the consequence of repeated exfoliation, and the integuments there are still in a state of ulceration, leaving portions of dead bone exposed. The whole of the upper lip, and the greater part of the lower, have been destroyed by ulceration; but the integuments surrounding the cavern into which the nostrils and mouth are now converted, though puckered and drawn inwards, are perfectly cicatrized. Especially on the left side, the finger is easily passed from the nostril into the antrum Highmorianum.

The eyelids on each side, as well as the eyebrows, have been completely removed by ulceration, and the skin has united to the conjunctiva, covering the sclerotica. The integuments proceed, in fact, from the circumference of the orbits into the conjunctiva bulbi, without forming any fold. The conjunctiva of each cornea is semi-opaque, permitting the dark appearance of the iris to be seen, but not the pupil. The eyeballs present their usual size, form, and consistence; but are almost destitute of motion. When the patient makes an effort to move the eyes, a slight motion of the skin is observed. Her whole power of vision consists in a perception of light and shade. She cannot distinguish whether one or two fingers be held before her eyes. The want of eyelids does not cause her much uneasiness when the eyes are shaded; but when she turns up her face towards the window, or to a bright light, the eyes are pained. Touching the eyeballs does not seem to excite any pain; they never appear red or inflamed. She does not seem to sleep much, and never soundly. When she goes to sleep, she covers the eyes with a bit of cloth. When she sits up, she keeps her head depressed towards her breast, so as to avoid the light.

On each side there is a small fistulous opening, apparently communicating with the lacrymal gland, from which there is a constant exudation of limpid fluid. When she weeps, which she does frequently, there is a copious flow of tears from these openings down the cheeks, and she says that at the same time she feels a burning pain in the eyeballs. The surface of the eyeballs is always dry; never covered with mucosity.

No puncta lacrymalia can be discerned on either side; but below the inner canthus on the right side, there are two ulcerated openings which appear to lead into the lacrymal passage. From the feeling of elasticity which pressure in the neighbourhood of the inner canthi, particularly on the right side, yields to the finger, it is probable that the ossa unguis are gone, though in consequence of the firmness of the cicatrice there, and the pain which pressure produces, it is difficult to ascertain this point with any thing like certainty. No other part of the orbits, however, appears to be destroyed.

She seems to enjoy a considerable degree of smell. She can detect a bad smell; and relishes the odour of snuff.

She speaks with great difficulty, but her daughter understands what she says. It is almost impossible for her to swallow fluids. When she swallows spoon meat, she lies on her back, and throwing the morsel down, she gulps it with difficulty, and an expression of pain. The tongue, from its constant exposure, is swollen and inflamed. Her hearing is much impaired.

Over the right scapula, there is a large ulcer, through which several pieces of bone have passed. The whole body is much emaciated. The arms and hands are particularly attenuated, and their joints very flaccid.

The commencement of her complaint she dates 14 years back. The bones of the head were affected, before any disease appeared in the face. The ulceration, after having destroyed the lower lip, attacked the upper eyelids, then the lower eyelids, whence it spread downwards and removed the nose and upper lip. The eyelids of both sides were removed before the nose was involved. She blames her husband for improper conduct towards her. She never had any eruption. She had not taken mercury antecedently to the disease commencing in the face. After that, she was salivated by mercury, and took large quantities of sarsaparilla, without the progress of the disease being checked. Large portions of bone came away at various intervals.

Dr. Jackson, in his notice of the case, remarks, that it shows to what a dreadful extent secondary syphilis will proceed, in spite of mercury, sarsaparilla, &c., in a patient in whom the primary symptoms have not been treated with mercury. He thinks the extensive exfoliation of bone could not, in this instance, be attributed to mercury, but to the influence of syphilis.

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[1] Lectures in the Lancet; Vol. x. p. 324; London, 1826: Lancet for 1830; 1831; Vol. i. p. 735.

[2] Lettres sur la Syphilis; p. 47; Paris, 1851.

[3] Nervous System of the Human Body; Appendix, p. lvi; London, 1830.

[4] Edinburgh Medical and Surgical Journal; Vol. xxxvii. p. 254; Edinburgh, 1832.

[5] Lancet, 8th September, 1838, p. 839.

SECTION VIII.—SYPHILITIC ERUPTIONS AFFECTING THE EYELIDS OF INFANTS.

Fig. Devergie, Clinique de la Maladie Syphilitique, Pl. 37; Paris, 1826.

Infants have been repeatedly brought to me, as affected with *sore eyes*, whom I have found to be labouring under the effects of congenital syphilis. This disease generally appears within a few weeks after birth, about the anus and organs of generation, and upon the face and hands. It assumes the form of pretty broad and flat pustules. They break, scab, spread, and run into one another, leaving the skin of a dark red colour, excoriated, and chapped, over almost the whole body, and with a peculiar wrinkled withered appearance, especially about the lips. The eyelids of such children inflame and adhere in the morning; the conjunctiva, without being swollen or much inflamed, secretes puriform mucus; the Meibomian and ciliary glands give out matter; the cilia and the hair of the head fall out; the nostrils become stuffed, so as to prevent the child from sucking; the mouth aphthous; the voice hoarse; there is much restlessness, itching, and fretfulness; and great emaciation ensues. The capsule of the lens is sometimes to be observed quite red, the pupil becomes contracted, the retina is probably insensible, and atrophy of the eyeball ensues. Not unfrequently the corneæ become infiltrated with pus, and give way; an event indicative of excessive debility, and generally a precursor of death.

Cases of this kind are much more frequent in infants than syphilitic iritis, uncombined with an eruption. They may readily be distinguished from ophthalmia neonatorum, but are sometimes confounded with ophthalmia tarsi. I have known cases treated as itch.

Case 130.—A child, 5 months old, was brought to me, with the left eye atrophic and the right cornea burst, the mouth presenting the chapped withered appearance, so characteristic of infantile syphilis. The eruption had disappeared. The mother was not conscious of having had any disease. A practitioner to whom she had applied, had given her cream of tartar and sulphur, telling her that by her taking this medicine, her child would be cured.

From half a grain to a grain of calomel, combined with from a twelfth to a sixth of a grain of opium, is to be administered thrice a-day. From one to two grains of hydrargyrum cum cretâ, twice or thrice a day, answer very well. In a few days, evident improvement takes place; and by perseverance in the remedy, a complete and permanent cure is effected.

Tepid ablution of the lids, and mild red precipitate salve to their edges on the child's going to sleep, make up the local treatment.

The father will be found to have laboured under evident symptoms of syphilis, previously to the conception of the child. The mother may, or may not, have been affected with evident symptoms: and it is remarkable, that she rarely if ever, becomes infected from her child; but if any other woman nurses a child diseased in the manner described, she is almost sure to take syphilis, becoming affected with first ulcers on the nipples, followed by sore throat, sores on the genitals, an eruption on the skin, and iritis. Those who handle the child, also, are apt to become infected.

SECTION IX. — CANCER OF THE EYELIDS.

Syn. Cancroïde; *Lebert.* Epithelial cancer. Epithelioma; *Hannover.*

Fig. Ammon, Zweiter Theil, Tab. III. figs. 1, 2, 3, 6, 7. Dalrymple, Pl. V. fig. 6.

All parts of the skin are not equally liable to be affected with cancerous ulceration. That of the face, and particularly that of the eyelids, is the most liable; and next, that of the lower lip. This disease, slowly consuming the skin and the muscles, destroys not merely the eyelids, but perhaps a great part of the cheek, entering also into the orbit, attacking the eyeball, and at length proving fatal. Dr. Jacob in some excellent observations[1] on the disease, points out, as its characteristic features, the extraordinary slowness of its progress, the peculiar condition of the edges and surface of the ulcer, the comparatively inconsiderable suffering produced by it, its being incurable unless by extirpation, and its not affecting the neighbouring lymphatic glands. Although not exempt from scirrhus and other malignant diseases, the eyebrow, and especially the eyelids, are particularly apt to suffer from that variety of cancer, which, from its structure being composed in a great measure of epidermic scales, is known by the appellation *epithelial.* This appellation, bestowed on this variety of cancer from the microscopical character of one of its elements, must not, however, deceive us into any less suspicious notion of its malignancy, than what was previously entertained.

Symptoms and progress. This affection of the eyelids rarely occurs until after middle life. It presents two stages; one of induration, and another of ulceration. At some particular spot, either close to the edge of one or other of the lids, but much more frequently the lower than the upper, at their temporal angle, or on the side of the nose, near the lacrymal caruncle, some degree of thickening and elevation may at first be discovered, indicating the existence of a peculiar kind of growth, but which the patient often neglects as a wart or something of no consequence. The indurated spot is at first uninflamed externally, presenting the natural colour of the skin, with the exception perhaps of some varicose vessels ramifying over it, and it is not particularly sensible. It may remain in this state for a considerable length of time, and attract almost no attention till it begins to ulcerate.

That the disease sometimes originates in a mere crust or wart, which being picked off with the finger leaves a raw surface, exposed to the irritation of the tears, and apt to spread by ulceration; or in some common sort of tumour, which, allowed to burst on the inside, or, it may be, on the outside of the eyelid, becomes fretted, and is thus induced to assume the ulcerous or cancerous action, is a doctrine[2] which must be received with some hesitation. It has been asserted, indeed, that a mere scratch or excoriation of the edge of the eyelid, or the irritation of an old cicatrice, such as that which results from small-pox, may give rise to cancer of the eyelids; but it is probable, that the ulcerative stage of the disease is always preceded by a deposition or hypertrophy of a specific kind.

As exciting causes, I may mention a blow with a rod of iron on the lower edge of the orbit, as giving origin to the disease in a man whose eyelids and eyeball I removed. In an old gentleman who consulted me, the irritation of the frame of his spectacles brought it on at the temporal angle of the eye, with eversion of the upper lid.

A doubtful point is, whether the Meibomian follicles are often, or ever, the original seat of this disease; but it seems generally admitted, that the induration may commence in the conjunctiva, and may be limited to it for a long time; the whole structures of the eyelid becoming at length thickened and knobbed, and assuming a dark red colour. The conjunctiva may then become ulcerated, and the ulceration gradually involve the other textures.

Scirrhus, ending in carcinomatous ulcer, has not been sufficiently distinguished from epithelial cancer. I was disposed to consider scirrhous a case which came under my observation, in which the first symptoms were hardening of the lower lid, fixedness as if it had been glued to the eyeball so that it could not be moved, and a remarkable degree of retraction, as if the disease, originating in the cellular membrane of the orbit, had dragged the eyelid inwards. In another case, which I saw at the Glasgow Eye Infirmary, 19th May, 1842, a tumour nearly an inch long, and half an inch broad, rose from the lower lid, covered at its middle with a scab. The patient was a woman of 78. On extirpation, the tumour was found made up of a mixed soft and gristly substance, apparently scirrhous.

In former editions of this Work I spoke of a variety of callosity of the eyelids, under the name of *tylosis scirrhoeides*, which I am now disposed to consider of the nature of epithelial cancer. I described it as attacking the lower lid more frequently than the upper; affecting

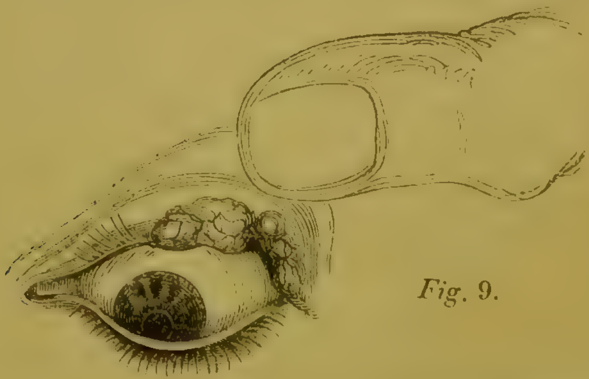
Fig. 9.

more the inner, than the outer, surface of the lid; being of a white, or slightly yellow colour, more or less tuberculated, and apt to end in ulceration. From its appearance (*Fig.* 9.), its occurring generally in old people, its intractable nature, and its ending in ulceration, I said it was liable to be confounded with scirrhus, with which, however, I considered it by no means identical.

I mentioned, that I had watched some cases of this kind for a number of years; and although the induration and swelling did not subside, yet, by care to avoid injuring the part, using the red precipitate salve to the edges of the lids, and applying lunar caustic solution to the ulcerated points, the complaint had been kept at bay, and the operation of removing the affected part avoided.

I said that, although sometimes successful in warding off the progress of the disease, in other cases it had caused such irritation of the eye, increased so much in size, and produced so much deformity, as to warrant extirpation. This I had recourse to in the instance figured above. In none of the cases in which I operated before ulceration took place, has there been any relapse.

The anatomical structure of *epithelioma*, as the disease now under our consideration has been termed, is different from that of any other variety of cancer. It consists not so much in the substitution of a new tissue, as in the alteration of a normal one; it is a hypertrophy of the superficial epidermic layer, complicated by inflammation and ultimately by ulceration. The circumstance, however, of a tumour consisting chiefly of epithelic corpuscles is not to be deemed sufficient evidence of its being an epithelial cancer. I have no doubt this would be the case nearly equally with the elevated edges of Jacob's "ulcer of peculiar character," and of Cock's "peculiar follicular disease,"[3] as well as of several other varieties of growth and ulcer of the skin, in malignancy and other particulars widely different from each other. Some epithelial growths are perfectly innocent.

The progress of the ulceration is generally very slow. I have known it for years confined to the lower eyelid, without making almost any advance; nay, occasionally contracting, and partially, or even totally, cicatrizing; again to commence, and spread for a certain space, and again to heal. It has been known to remain for ten, nay, for twenty years, without making much progress. In other cases, however, we see the eyelids entirely destroyed, the eyeball exposed, so as to become inflamed and at last to burst, the lacrymal passage laid open, the bones of the orbit deprived of their periosteum and rendered carious, while the ulcer, spreading down the face, eats away the cheek, lays bare the teeth, and at last forms a hideous opening communicating with the mouth. Yet, even after it has produced the most shocking deformity, its progress is sometimes stayed for months or for years, so that the individual lives with his eyelids entirely gone, the eyeball dissected from almost all its connexions, and perhaps half of the face destroyed.

The appearances of the diseased surface are different at different times. Sometimes it presents a scab, which, on being removed, is succeeded by another; but generally the sore exposed on removing these successive scabs, is found to be slowly enlarging, growing deeper, and becoming more painful. When the sore becomes an open ulcer, too large, irregular, and active to be covered by a scab, we observe that it eats away all parts indiscriminately which may be in the direction in which it is spreading. In one of the cases which have fallen under my care, the ulceration of the skin appeared, after a time, entirely to cease, while the disease proceeded deep into the orbit by the inner side of the eyeball. Not unfrequently, we find that the progress of the ulceration is checked at one part of the circumference of the sore, while it is advancing at another; or that the whole sore assumes, for a time, a healing action. When this is the case, the pain grows less, the edges become smooth and glossy, and even the part within the edges becomes smooth, or is gradually covered with florid healthy-looking granulations. These are occasionally firm in texture, and remain unchanged in size and form for a length of time. Veins of considerable size are seen ramifying over the surface of the sore. If it heals up, it does so in patches, which are hard and smooth, and marked with the same venous ramifications. When it again begins to ulcerate, it loses its florid hue and glistening and granulating appearance. There is often a tendency to actual reparation, as well as to cicatrization; there is a deposition of new material, and a filling up in certain places, which gives an uniformity to the surface, which otherwise would be very irregular. The healing which occurs may take place on any part of the surface, whatever be the original structure. In a case which Dr. Jacob had under his care, the eyeball itself, denuded as it was by ulceration, became partially cicatrized.

The skin in the vicinity of the sore is not, in general, much thickened, or discoloured, differing in these respects from the disease called *lupus*, or *noli me tangere*, in which a diffused swelling and a deep blush surround the ulcer. In cancer of the eyelids, the edges of the ulcer are occasionally formed into a range of elevations or tubercles, of a pale red colour, which, if removed with the knife, are speedily reproduced. But there is, in general, little or no fungous growth in this disease, nor indeed any elevation, except at the edges of the sore.

The veins which ramify over the surface of the sore are apt to give way, and considerable bleeding to take place. From the surface itself of the ulcer, there is no considerable bleeding. When hæmorrhage does occur, it arises from the superficial veins giving way, and not from sloughing or ulceration opening the vessels. Sometimes the surface of the sore assumes a dark gangrenous appearance, arising from effusion of blood beneath.

The discharge from the surface of the sore is not, in general, of the description called unhealthy, nor sanious, but yellow, and of proper consistence; neither is there more fetor than from the healthiest sore, if the parts be kept perfectly clean, and dressed frequently. Mr. Travers, however, whose short notice[4] of this disease differs in several particulars from the more elaborate description of Dr. Jacob, mentions, that it is attended by an unhealthy discharge.

Dr. Jacob has represented the sufferings of persons labouring under this disease as not very acute. He says, there is no lancinating pain, and that the principal distress appears to arise from the exposure, by ulceration, of nerves and other highly sensible parts. In the cases he had met with, the disease, at the worst period, did not incapacitate the patients from following their usual occupations. He states that one gentleman, who laboured under this disease for nine years, and who died from a different cause, was cheerful, and enjoyed the comforts of social life after the ulceration had made the most deplorable ravages. These statements of Dr. Jacob may be received with implicit confidence. Yet it must be noticed that, when the ulceration affects the infra-orbitary and supra-orbitary nerves, very severe suffering is experienced. I have also witnessed the most excruciating pain when the eyeball was attacked. It ulcerates and bursts, the lens and vitreous humour are evacuated, and sometimes till this emptying of the eye is effected, the pain is agonizing. I have known the lens protrude through the cornea for several days, producing great irritation.

When the disease extends to the periosteum, the bones of the orbit are laid bare, and become carious. They sometimes exfoliate in small scales, but more generally they are destroyed, as the soft parts are, by an ulcerative process. This may proceed to such a length, as to expose the nostril or the antrum, through the destroyed orbit, or even to lay open the cavity of the cranium through the orbitary plate of the frontal bone. Inflammation of the dura mater and of the brain will, in this case, soon put an end to the patient's sufferings; although more commonly he dies worn out by fever, and sometimes by diarrhœa.

Diagnosis. The researches of Burns, Hey, Abernethy, Wardrop, Breschet, Fawdington, and others, into the nature of malignant tumours and ulcers, have established at least this fact, that there are essential differences between a number of diseases formerly confounded under the appellation of cancer. We are now at no loss in distinguishing scirrhus from spongoid tumour, and spongoid tumour from melanosis; but with regard to the malignant ulcerations which attack different parts of the skin, and especially the skin of the face, there existed, till very lately, a considerable degree of confusion. To the microscopical examinations of malignant growths, we owe the important establishment of epithelial cancer as a distinct species of disease.

Dr. Bateman, Mr. S. Cooper, and others, seem to consider the disease of the eyelids which we have been considering, as *noli me tangere*, which, according to Sir A. Cooper, is an ulceration of the cutaneous follicles. Dr. Jacob, however, observes, that the disease commonly called cancer of the eyelids, is evidently peculiar in its nature, and is to be confounded neither with genuine *carcinoma*, nor with the disease called *lupus*, or *noli me tangere*. From the former he thinks it may be distinguished by the absence of lancinating pain, fungous growth, fetor, slough, hæmorrhage, and contamination of the lymphatics; from the latter, by the absence of the furfuraceous scabs, and inflamed margins, as well as by the general appearance of the ulcer, its history, and progress. Mr. Lawrence has contrasted[5] cancer of the skin with lupus; the latter is a disease which also sometimes involves the eyelids[6]; but in fact it is not easy to describe in words the differences between such diseases.

From syphilitic chancre, cancer of the eyelids may generally be distinguished by its slow progress, by its not causing so much swelling of the integuments around the ulcer, and by its history.

Occurring in the skin over the lacrymal sac, I have known this disease mistaken for dacryocystitis. One patient called on me expressly to have a style introduced. Another had actually worn a style, which he fancied had dropped down into the nasal duct, and which he wished extracted. There was no style; it had probably dropped out by the opening through the skin.

Prognosis. Left to itself, epithelial cancer of the eyelids compromises the life of the patient. While other varieties of cancer are of constitutional origin, and involve the economy generally, this seems entirely a local disease; and hence, no doubt, the slowness of its progress. The fact of there being in epithelial cancer no tendency to lymphathic propagation, so that the general health may remain long intact, renders the prognosis somewhat less unfavourable, and seems to afford grounds for the hope that extirpation may prove a complete cure. The disease, however, often returns.

Treatment. — 1. *Alterative and other medicines.* It is a question of great importance, whether this disease can be removed by any other means than the knife, or powerful escharotics. Dr. Jacob's opinion is, that it bids defiance to all remedies short of extirpation. "I have tried," says he, "internally, alterative mercurials, antimony, sarsaparilla, acids, cicuta, arsenic, iron, and other remedies; and locally, simple and compound poultices, ointments, and washes, containing mercury, lead, zinc, copper, arsenic, sulphur, tar, cicuta, opium, belladonna, nitrate of silver, and acids, without arresting for a moment the progress of the disease. I have indeed observed," adds he, "that one of those cases which is completely neglected, and left without any other dressing than a piece of rag, is slower in its progress than another which has had all the resources of surgery exhausted upon it."

Although these remarks of Dr. Jacob are perhaps rather too sweeping, yet it cannot be denied, that both internal and external remedies have extremely little control over this disease, and that though it may for a time seem to mend under their influence, it has rarely, if ever, been known to be thoroughly cured, except by destroying the part with escharotics, or removing it by the knife.

The precipitated carbonate of iron sprinkled on the sore, and arsenic internally, are the means which, I believe, do most good. I have known them to operate as palliatives, but never to produce a radical cure; and therefore I should never trust to them. Whatever treatment improves the general health, has a favourable influence on the local disease. I have known the ulcer from this cause, improve considerably under the employment of two grains of calomel, with half a grain of opium, continued each night for several months.

2. *Diet.* Mild nutriment, without wine, is the diet which should be adopted.

Case 131.—Dr. Twitchell, an American surgeon of note, aged 68, cured himself of a cancer of the eyelid, by abandoning the use of flesh, and living entirely, for two years, on bread, milk, and cream. The disease had been slowly increasing for about ten years, and had been twice ineffectually removed by the knife.[7]

3. *Caustics.* These means are certainly not much to be commended; being more painful and not so sure as the knife. They do occasionally succeed, when the disease is limited to the outer surface of the eyelid, or to the skin of the nose; never, when the whole thickness of the eyelid is affected. Often they do harm instead of good.[8] As caustics which act not on the surface alone, but deeply, if allowed to remain in contact with the diseased part, may be mentioned, hydrate of potassa and quicklime, made into a paste with a few drops of alcohol, and chloride of zinc, made into a paste, with flour or calcined sulphate of lime. The danger of using such substances, on the eyelids, arises from their aptitude to spread to the eyeball. The best, perhaps, and most manageable, is the pencil of potassa fusa.

The great advantage derived from arsenical applications to lupus, has led to their use in cancerous ulcerations of the face; but in these cases they are neither so efficacious, nor so safe as in the former. Sometimes the irritation produced by them occasions the sore to spread more rapidly than it would otherwise do.

Dr. Jacob mentions, that a woman in the Incurable Hospital at Dublin, had had a burning cancer plaister applied several times, and seventeen years after, the arsenical composition called Plunket's powder, without any good effect. A gentleman, to whose case he repeatedly refers, had the sore healed, when it was very small, by the free application of lunar caustic, under the care of Mr Travers. It broke out again, however, and spread, without interruption, until it destroyed the lids and globe of the eye. Under these circumstances, he, in despair, submitted himself to a quack, who, bold from ignorance, gave a full trial to escharotics. He repeatedly applied what was understood to be a solution of muriate of mercury in strong nitric acid, which, in a short time, produced a hideous cavern, extending from the orbitary plate of the frontal bone above to the floor of the maxillary sinus below, and from the ear on the outside, to the septum narium within. The unfortunate gentleman survived, the disease continuing to preserve, in every respect, its original character.

Case 132.—Dufresne, a bleacher, aged 30, was admitted into the Hôtel Dieu on the 23d February 1831, having been affected for seven or eight months with a carcinomatous ulcer at the inner angle of the right eye. The ulcer had continued to extend itself from the very commencement.

M. Dupuytren, having satisfied himself of the cancerous nature of the disease, endeavoured to effect its destruction by cauterization with the nitrate of mercury dissolved in nitric acid, a remedy he had found to succeed in similar cases. Three or four cauterizations were practised at intervals of eight or ten days; the fourth induced an erysipelas of the face, which had not been cured when M. Breschet took charge of the patient. He deferred attacking the cancer again, till the erysipelas had entirely disappeared.

On the 10th April, the ulcer was of an oblong form, occupying the inner angle of the right eye, and the corresponding ala of the nose; its base had a fungous nipple-like appearance, of a livid colour, and it discharged a trifling quantity of fetid sanies. Its edges were unequal, notched, and a little inverted.

An ointment, composed of seven parts of lard and one of iodide of mercury, was now applied daily; but, after three weeks, the ulcer was scarcely in the least improved. The application was therefore changed for another, composed of seven parts of lard and one of biniodide of mercury. In a few days, the appearance of the sore was completely changed, its base became of a vermilion tint, the nipple-like excrescences and fetid discharge disappeared, and the swollen edges gradually shrunk. After 12 days' employment of the ointment, the sore was treated with simple dressing, and healed rapidly. On the 3d May, the patient was dismissed entirely cured, without deformity, the scar being white, flexible, and free from pain or tumefaction.[9]

4. *Extirpation by the knife.* When the disease exists in a situation which admits of extirpation by the knife, the sooner it is done the better.

The effects of removing one or both lids, have already been explained. The upper lid will, much more than we could expect, supply the loss of the lower lid; and the lower that of the upper. If, however, the whole of the upper lid, or of both lids be removed, the cornea will become gradually opaque from exposure, and the conjunctiva cuticular and insensible.

Even when the disease is confined to the moveable part of the lids, I consider it better to remove it by a similunar incision, than by one of the form of the letter V, and to allow the wound to heal by granulation, than by bringing its edges together with stitches.

A hook or ligature being passed under the parts to be removed, so as to enable us to hold them and elevate them from the subjacent textures, the incisions ought to be made into the sound parts. If the disease adheres to the perichondrium, the whole thickness of the lid must be sacrificed; if to the periosteum, it must carefully be removed. If the disease has spread in any considerable degree to the conjunctiva of the eyeball, the eye can scarcely be saved, although this appears to have been effected in one instance, by Gräfe.

Case 133.—Daviel was called to an Ursuline nun at Bordeaux, 45 years old, on account of a tumour which she had for 20 years upon her right upper eyelid. It began by a small wen, and increased by degrees so as very much to incommode the patient.

She applied to a surgeon, who began with some drops of a liquid caustic, which enraged the tumour still more; he appeased it again by anodyne medicines; and, although the patient felt a continual sharp pain in the part, the tumour remained a long time without any sensible increase. She consulted another surgeon, however, who cut off the tumour. The ulcer, which was the result of this operation, did not heal, but, on the contrary, made great progress, and became callous. The surgeon touched it with lapis infernalis, and sometimes with a liquid caustic, which much increased the evil.

Daviel was of opinion, that there remained no other method of treatment, but a farther extirpation, which might not only save the eye, but prevent an incurable and fatal cancer. The disease had already made great progress under the eyelid, and it was much to be feared that it would spread into the eye, and over the face. He passed a crooked needle, with a waxed thread, under the lid, by which he suspended and drew up the lid and the tumour, which he cut off with a pair of curved scissors, as far as he could under the orbit. Slight hæmorrhage ensued, but was soon stopped with dry lint, and a compress and bandage.

In 14 days she was perfectly cured; and although the lid was cut away very high, the eye remained very neat and well, performing its several functions properly when Daviel left Bordeaux. Six years afterwards, he found the patient extremely well, seeing perfectly with the eye. What he considered very singular was, that the skin of the lid descended pretty low to the cornea, which it almost covered; so that the whole globe was in a manner hid. The descending skin looked like a lid without eyelashes.[10]

Case 134.—A woman, 60 years old, had a cancerous tumour, for 16 years, in the inner angle of the right eye. It began by a little wart, which itched violently, and made her scratch it very often, which so irritated the tumour, that in a little time it became as large as a dried fig flattened, with its edges turned outward and callous. It reached from the commissure of the lids to the ala nasi, and adhered to the bone.

Daviel dissected off the tumour down to the periosteum, but did not lay the bone bare; for he thought it sufficient for a complete cure to take away all the callosities. But he was mistaken; for the swelling increased, and the wound seemed larger than before. He used, in vain, all the remedies commonly thought of in such cases; he scarified the edges of the ulcer, to bring it to suppuration; but it became more hard and callous than before the operation, and much more painful. He now resolved to cut away all that remained of the tumour, with the periosteum, which appeared very much swelled. This second operation was so successful, that the swelling, and every other bad symptom, disappeared almost suddenly. In three days the wound looked red and very well, without any pain, and the cicatrice was perfectly formed on the 15th day from the operation, without any sensible exfoliation of the bone, or the least deformity of the eye. Five years after Daviel saw the patient in perfect health, and the cicatrice of the part very even.[11]

Case 135.—A country woman, 42 years of age, sought assistance on account of a cancerous tumour, which occupied the inner third of the upper and under eyelids, the caruncula lacrymalis, and the inner commissure, as far as the back of the nose, and was connected with the conjunctiva of the eyeball. Although, under these circumstances, there appeared little hope of saving the eyeball, yet this was attempted by the extirpation of all the diseased parts. For this purpose Gräfe passed, from the side of the eye towards the nose, a bodkin-shaped instrument through the middle of the basis of the swelling, and carefully separated the diseased part of the conjunctiva from the eyeball. Then with a pair of blunt-pointed scissors he divided the upper eyelid as far as the arch of the orbit, in such a way that the whole inner third of the eyelid was separated from the middle third; a similar incision was then made through the lower eyelid, and the two extremities of these incisions joined by another in a curved direction over the back of the nose. The carcinomatous tumour was then separated from the bones. After this, in consequence of the retraction of the remaining parts of the eyelids, nearly the whole of the inner half of the anterior hemisphere of the eye was exposed.

The wound was dressed simply with warm water, and the same dressing continued daily. To the joy of all concerned, the eyelids elongated, whilst the granulations extended more and more inwards, and within three weeks were united in such a way by a cicatrice, that not the slightest deformity or exposure of the eye remained. The reproduced commissure was found, on close inspection, to want the puncta lacrymalia, the caruncula, and semilunar fold. The loss of all these parts, and the complete removal of both canaliculi lacrymales, produced no stillicidium lacrymarum, which, on physiological grounds, was to have been expected. Rudolphi was requested to examine the patient; but he was as unsuccessful as Gräfe, in discovering the manner in which the tears were removed after the destruction of the parts above mentioned.[12]

In several cases, I have removed a large portion of both lids, along with their nasal commissure, and have been surprised at the rapidity with which the wound healed, and the little deformity which ensued. In one instance, however, the cicatrice drew the lids so much towards the nose, that the patient could open the eye but very incompletely. In the case already referred to, in which I removed both lids, along with the eyeball, the skin contracted in the course of healing so as to cover the whole front of the orbit, leaving an aperture sufficient only to allow a quill to enter.

When one or other lid has been removed by the disease or by the knife, it has been proposed to replace it by a new lid formed out of the neighbouring integuments.[13] So far as the loss of the lower lid is concerned, such a procedure is unnecessary. The deformity and inconvenience arising from the want of the lower lid is trifling. The mere contraction of the cicatrice suffices to bring up the cheek to the level of the lower edge of the orbit. The skin unites to the conjunctiva, and at first sight, it is not observed that the eyelid has been removed. The palpebral opening is a little smaller than natural, both from above downwards, on account of the upper lid descending more than usual, and transversely, from the external angle of the lids having assumed a rounded form. Autoplasty, under such circumstances, would do little good.

It is different with the upper eyelid. As its loss is likely to lead to a callous state of the investing membrane of the eyeball, opacity of the cornea, and loss of vision, the proposal of forming a supplementary upper lid has something to be said in its favour.

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[1] Dublin Hospital Reports; Vol. iv. p. 232; Dublin, 1827.

[2] Daviel, Philosophical Transactions; Vol. xlix. Part i. p. 186; London, 1756: Warren's Surgical Observations on Tumours, p. 27; Boston, 1837.

[3] Guy's Hospital Reports, Second Series; Vol. viii. pp. 168, 170.

[4] Synopsis of the Diseases of the Eye; p. 100; London, 1820.

[5] Lectures on Surgery; London Medical Gazette; Vol. vi. p. 194; London, 1830.

[6] Basedow, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xv. p. 497; Berlin, 1831: Dalrymple's Pathology of the Human Eye, Pl. V. fig. 5; London, 1849.

[7] This case is minutely recorded in the Charleston Medical Journal, for Nov. 1849; and quoted in the American Journal of the Medical Sciences, for July, 1850, p. 269.

[8] See Daviel's 1st and 10th cases, Op. cit. p. 186.

[9] Quoted from the Lancette Française, in the Lancet, for 1830, 1831; Vol. ii. p. 607.

[10] Op. cit. p. 189.

[11] Ibid. p. 191.

[12] 1822. Jahres-Bericht über das clinische chirurgisch-augenärztliche Institut der Universität zu Berlin, p. 3; Berlin, 1823.

[13] Auvert, Selecta Praxis, Fasciculus II.: Ammon's Darstellungen, Zweiter Theil, Tab. vi. figs. 3, 4.

SECTION X.—INFLAMMATION OF THE EDGES OF THE EYELIDS, OR OPHTHALMIA TARSI.

Syn.—Blepharitis scrofulosa.

Fig. Dalrymple, Pl. I. figs. 3, 4. Pl. II. figs. 1, 2.

The edges of the eyelids are subject to an inflammation of a very tedious character. It is this disease which, closing the Meibomian follicles, and destroying the bulbs of the eyelashes, produces the state termed *blear eyes.* If long neglected, it becomes obstinate, and, in some respects, incurable.

We usually term this disease *ophthalmia tarsi;* but it has received various names, and different views have been entertained of its nature. Any one affected with this complaint, was called by the Romans *lippus.* Hence *lippitudo,* which we sometimes use to signify the effects of this disease. Celsus's lippitudo was what we now designate by the name of catarrhal or purulent ophthalmia. Ophthalmia tarsi he describes under the name of *xerophthalmia* or *lippitudo arida.* Comparing ophthalmia tarsi to eruptions of the hairy scalp, it has been called by some, *tinea palpebrarum;* while others have regarded it as herpetic or porriginous. As itchiness is one of the symptoms of the disease, it has been called *scabies palpebrarum,* and *psorophthalmia;* but that this complaint ever partakes of the nature of psora, is a notion which, in this country, is entirely laid aside.

Ophthalmia tarsi affects the Meibomian follicles, their apertures running along the edge of the lid near its inner margin, the neighbouring portion of the conjunctiva, the glands at the roots of the eyelashes, and the surrounding skin. Even the cartilage is sometimes implicated.

Local symptoms. One of the most striking symptoms of the disease is the adhesion of the edges of the eyelids in the morning, by means of a glutinous and superabundant secretion from the conjunctiva, Meibomian follicles, and ciliary glands. Incrusting during sleep into a gummy consistence, this matter binds the eyelashes together, so that the patient is obliged either to soften them before opening his eyes in the morning, or to use considerable, and even painful, effort for their separation. This is accomplished not without tearing out some of the eyelashes, which no doubt aggravates the inflammation of the sebaceous follicles at their roots, and produces a succession of little abscesses and ulcers. Frequently torn out in this way, and their bulbs injured or destroyed, the eyelashes are apt to become feeble, dwarfish, and irregular, or their reproduction to cease.

The Meibomian secretion, naturally bland, and small in quantity, serving merely to smear the edges of the eyelids, so as to prevent them from adhering, and to conduct the mucus of the conjunctiva and the tears towards the puncta lacrymalia, becomes in this disease augmented in quantity, and changed into a puriform matter. This matter of itself, as well as the inflammation in which it originates, causes constant irritation, and frequent itchiness of the eye and eyelids, and adhering to the eyelashes, prevents the little ulcers from healing which arise at their roots. The tears, excited by the irritation, are discharged more frequently than natural, and being no longer conducted along the edges of the lids towards the puncta lacrymalia, as they are in health, they drop over upon the cheek, chafing and excoriating the integuments. The consequence is, that we frequently find this disease attended with much swelling and redness of the eyelids, and the skin of the cheeks inflamed, ulcerated, or covered with scabs. Not unfrequently, the conjunctiva, lining the lids, is considerably inflamed, and gives out a disordered secretion. One or more of the Meibomian follicles are often greatly distended with purulent matter, which oozes out from their apertures on pressure. In other cases, the edges of the eyelids are occupied by a thick crust of matter, under which ulceration is proceeding slowly to destroy the secretory apparatus of the eyelashes. Sometimes the whole substance of the eyelids, near their edges, is thickened, indurated, and distorted; a state which is termed *tylosis*.

The local symptoms of ophthalmia tarsi vary considerably in severity, in obstinacy, in the appearances of the matter discharged, and even in the seat of the principal morbid changes; for in some the Meibomian follicles, in others the ciliary glands or bulbs of the eyelashes, are the parts chiefly affected.

The inflamed state of the conjunctiva in this disease, as well as that of the Meibomian follicles themselves, produces a feeling of sand, or a sensation of roughness in the eyes, which causes the patient to open the lids partially, and frequently to keep them close altogether. He complains also of feelings of stiffness, dryness alternating with agglutination, heat, soreness, and intolerance of light, increased in the evenings, or when he exerts his eyes on minute objects.

Two events are apt to follow, when ophthalmia tarsi has continued long, and been neglected. The one is a partial or total obliteration of the Meibomian apertures, along the margin of one or both eyelids. These orifices are in fact skinned over. In this case, which may be regarded as incurable, the inner margin of the affected lid becomes rounded off, instead of being angular; it is smooth, red, and glistening; no Meibomian secretion is seen oozing out upon pressure, and generally the eyelashes are in a great measure wanting. The other event is lagophthalmos and eversion of the lower lid, originating in the contracted state of the skin, consequent to the healing up of the excoriated eyelid and cheek. Not unfrequently these two sequelæ go together.

Trichiasis or inversion of the eyelashes, distichiasis or misplaced eyelashes, and even inversion of the lids, must also be enumerated among the effects of long-continued ophthalmia tarsi. Those in whom the palpebral conjunctiva is much affected or suffers from repeated ulcerations, and who acquire a habit of opening their eyes very partially, are most subject to inversion.

Constitutional symptoms. Inflammation of the edges of the eyelids is much more frequent in children than in adults. In almost every case, the patient presents undoubted marks of a scrofulous constitution; the functions of the skin, and of the digestive organs, are disordered; and the general health impaired. Occasionally, we find the disease associated with scrofulous conjunctivitis, enlarged lymphatic glands, swollen upper-lip, sore ears, scald head, tumid abdomen, paleness and looseness of the skin, restlessness during the night, and morning perspirations. In general, however, ophthalmia tarsi does not affect the general health in so great a degree as the disease called scrofulous ophthalmia or phlyctenular inflammation of the conjunctiva.

Causes. Ophthalmia tarsi is by no means always a primary disease; but frequently takes its origin from catarrhal ophthalmia, ophthalmia neonatorum, or scrofulous conjunctivitis, or from the affections of the eyes attendant on measles, scarlatina, or small-pox. In all these diseases there is more or less inflammation of the Meibomian follicles, and when the other symptoms subside or totally disappear, the ophthalmia tarsi is apt to remain. When this disease appears to be primary, cold, impure air, smoke, and filthiness, operating directly on the eyelids, are among the most common exciting causes; while the scrofulous constitution, aggravated by indigestible or unwholesome food, and other causes, affords its aid in perpetuating the complaint, or at least in favouring relapses. In adults, we often find the habitual use of wine and spirits keeping up this affection of the eyelids. Linnæus[1] tells us, that the Laplanders are generally blear eyed. He ascribes this to their exposure to the sharp winds, the reflection from the snow, the fogs, the smoke, which escapes only by a hole in the roof of their huts, and the severity of the cold. The Finlanders are afflicted in the same way, and many of them thereby deprived of sight.

Treatment. The treatment of this disease comprehends, 1st, Remedies likely to abate the inflammation, upon which the whole train of symptoms originally depends, to soothe the pain and itching, and prevent the bad effects of the glueing together of the lids; 2dly, Such applications, whether astringent, stimulant, escharotic, or epulotic, as may deaden the excoriated and ulcerated parts, promote their healing, or strengthen the debilitated eyelids; and 3rdly, Constitutional remedies.

1. The first direction to be given to the patient, or to his attendant, is never to attempt to open the eyes in the morning, till the concreted purulent matter is completely softened, so that the eyelids may separate without pain, and without injuring the eyelashes. For this purpose, a tea-spoonful of milk, with a bit of fresh butter melted in it, may be employed for smearing the lids, rubbing it with the finger gently along the agglutinated eyelashes. A piece of soft sponge, wrung out of hot water, is then to be held upon the eyelids for some minutes; after which the patient will find the eyelids yield, without pain, to the least effort he makes to open them. With the finger nail, the whole of the matter is immediately to be removed; and should it happen, that during the day, or towards evening, there is any reappearance of it, the same plan must again be adopted. This is absolutely necessary, because so long as the matter is allowed to remain, no application of lotion or salve can be of any use, as it never gets into contact with the seat of the disease.

2. Occasional scarification of the palpebral conjunctiva, and the application of leeches to the external surface of the lids, and to the neighbouring skin, are to be employed for the purpose of subduing the inflammation.

3. Advantage is derived from emollient, refrigerant, and sometimes astringent applications, in the form of fomentations, cataplasms, pledgets, and collyria.

For example, after the lids have been completely freed from their morbid secretion in the morning, they may be fomented with warm water, or a warm decoction of poppy heads, chamomile flowers, the leaves of water germander, or the like; and this may be repeated once or twice in the course of the day, till the pain and principal inflammatory symptoms subside.

Cataplasms of bread and water, with a little fresh butter or olive oil, inclosed in a small linen bag, and laid over the eyelids through the night, are useful in aggravated cases. A cataplasm, made of crumb of bread and weak vinegar, is often of service. A piece of caddis, spread with some soft cerate, and kept upon the eyes during the night, is useful.

When the disease is slight or incipient, an evaporating lotion proves grateful to the patient, and promotes a cure. One or two drachms of the spirit of nitrous ether, with as much vinegar, in 8 ounces of water, frequently applied to the lids by means of a bit of sponge, will answer this purpose.

In cases of longer standing, and especially after the inflammatory symptoms are somewhat subdued, it is advantageous, repeatedly during the day, to bathe the eyelids carefully with a solution of from one to two grains of corrosive sublimate in eight ounces of water. This solution may be used cold or tepid, as the patient inclines; and after the outside and edges of the lids are well soaked with it, it may be allowed to run in upon the eye, so as to come into contact with the inner surface of the lids.

Other collyria may also be employed; as a weak solution of sulphate of zinc, or a mixture of brandy and water. One of the chief uses of the collyria is to keep the eyelids perfectly clean, without which no cure can be effected.

4. Counter-irritation, by means of blisters behind the ears or to the nape of the neck, a warm plaister between the shoulders, or a caustic issue in the neck, is often attended with benefit. Indeed, it rarely happens that much good can be done without a continued discharge, in those cases in which the lids, from long neglect, have become greatly thickened and callous.

5. The application of a salve to the edges of the eyelids at bedtime, is an essential part of the treatment. The salves which have been found most useful, are those possessed of a stimulating or slightly escharotic power, such as the red precipitate, or the subnitrate of mercury salve. The latter, commonly known by the name of citrine ointment, is prepared according to the formula in the Pharmacopœia, but is usually much reduced in strength, before being employed as an eye-salve. The former consists of from 12 to 20 grains of red precipitate, carefully levigated into an impalpable orange powder, and mixed with one ounce of butter, or lard, free from salt. About the bulk of a split pea of the salve selected, is to be melted on the end of the finger, and rubbed into the roots of the eyelashes, and along the Meibomian apertures, every night, or every second night, according to the severity of the symptoms and the effects produced. If much irritation follows the application of the salve, once every second night will be sufficiently often, a little simple cerate, softened by an addition of axunge, being used on the alternate nights.

Some surgeons trust their patients with a very weak salve only, which is to be applied freely, by rubbing it along the edges of the lids; while, with a camel-hair pencil, they themselves apply occasionally some stronger salve, such as one composed of 10 grains of nitras argenti to the ounce of soft cerate, taking care to confine the application to the diseased parts.

Salves are often employed for the cure of ophthalmia tarsi, without almost any effect, from these two necessary particulars not being known or not attended to; namely, that the salve is not to be smeared over the purulent crust formed by the disease, but applied only after the lids are freed from every particle of the morbid secretion; and that it is not to be pencilled softly on, but pressed, by repeated friction, into the diseased roots of the eyelashes, and into the mouths of the Meibomian follicles. Unless it smarts considerably, it, in general, does little good.

Other salves besides those above mentioned, are sometimes employed in this disease; especially Janin's, which consists of 2 drachms of prepared tutty, the same quantity of Armenian bole, and 1 drachm of the white precipitate of mercury, with half an ounce of lard. In old people, and in those incurable cases in which the Meibomian apertures are obliterated, this salve answers better, perhaps, than any other. The ointment of oxide of zinc, one composed of 2 drachms of burnt alum to 1 ounce of lard, and various others, have also been used. In cases supposed to be porriginous, a mixture of precipitated sulphur with diluted subnitrate of mercury ointment, has been found very effectual.

Not unfrequently we meet with slight, but very irritable cases of ophthalmia tarsi, in which not even the mildest salve can be borne. Fomentations, with poppy decoction, or simply with warm water, afford most relief in such cases.

6. If small ulcers are present along the edges of the lids, they are to be touched with the lunar caustic solution, or with the solid nitras argenti. It is useful, also, to touch the inflamed conjunctiva, from time to time, with the same solution.

When the lids are greatly thickened and indurated, their edges much incrusted, and the roots of the eyelashes ulcerated, it has been recommended to extract all the eyelashes, and then touch the whole diseased surface lightly with a pencil of lunar caustic. This has a great effect in healing the ulcers and diminishing the swelling. In a few days, the caustic may be repeated. Three or four repetitions are generally sufficient. This is the practice of Quadri of Naples, who, in the interval between one application of caustic and another, bathes the parts with brandy.[3] Mr. Lawrence, who also recommends the practice, states as an additional inducement to extract the cilia, that those which fall out by ulceration are never replaced, because the bulb which secretes the hair is destroyed; but when they are plucked out, they are afterwards restored. It is not, however, absolutely necessary to extract the cilia, in order to derive advantage from the application of the lunar caustic. I have frequently employed it, after having merely cleared the cilia of the morbid crust which adheres to them, and found the practice highly useful.

7. As the obstinacy of ophthalmia tarsi almost invariably depends on a faulty constitution, tonics and alteratives are always necessary. The tonics chiefly to be depended on are the sulphate of quina, and other preparations of bark, the mineral acids, the precipitated carbonate of iron, and chalybeates in general. These are to be given in appropriate doses, and continued for a length of time. A solution of 15 grains of muriate of barytes in half an ounce of diluted tincture of bark, of which from 8 to 20 drops are given thrice a-day, in a wine-glass of water, is much recommended by Dr. Zimmer of Prague, and I have witnessed good effects from it.[4]

The alteratives chiefly employed in the cure of this disease, are iodine and mercury, the former as iodide of potassium, the latter in the form of Plummer's pill. Purgatives are useful from the first; and whether alteratives or tonics are afterwards employed, a dose of laxative medicine, as sulphate of magnesia, infusion of senna, or powdered rhubarb and jalap, ought to be occasionally interposed.

8. The regulation of the patient's diet is essential for the cure of this disease. Care is to be taken that the stomach be not overloaded at bedtime, or disturbed by indigestible or improper food during the day; for, if this be permitted, the morbid secretion from

the lids becomes more copious, and a greater degree of irritation and inflammation is induced.

9. The warm bath, with sea-water, if it can be had, is an excellent remedy. The vapour-bath is also useful. If neither of them can be procured, let the tepid pediluvium be employed every night at bedtime.

10. Pure air, and regular exercise, are to be recommended. Violent exercise is to be avoided, as Horace knew, himself afflicted with this disease: —

> Namque pilâ lippis inimicum et ludere crudis.[5]

11. The clothing of those affected with ophthalmia tarsi ought to be particularly attended to. A delicate child is easily chilled. The skin, stomach, liver, and bowels are thereby disordered; and an attack of this disease, or of scrofulous conjunctivitis, is a frequent concomitant. The difficulty of curing these diseases is always increased, when the weather is damp and cold.

12. Sleep at early hours is of great consequence. Hardly any thing tends more to confirm this affection of the lids, than sitting up late at night, especially if the eyes are at the same time employed on minute objects.

Prognosis. So obstinate is ophthalmia tarsi in many instances, that we are not unfrequently asked, if it will ever be cured. The answer depends on the state of the Meibomian apertures, and on the perseverance of the patient, or his friends, in the means of cure. If, from neglect, the mouths of the Meibomian follicles, in number about 30 on the edge of each eyelid, are partially, or totally obliterated, so that the skin covering them is smooth and shining, and nothing can be pressed out of them, the case is so far incurable; and the patient must, for life, pay attention that the lids do not get worse. He must use Janin's or some other salve, every night; and follow the general directions regarding diet, clothing, and exposure, already laid down. If, on the other hand, the Meibomian apertures are patent, however much inflamed and disfigured the eyelids are by the disease, the case is perfectly curable by perseverance; but even after the symptoms appear completely gone, the remedies will require to be continued, for months at least. The establishment of puberty exercises its influence over this, as over other scrofulous diseases.

Sequelæ. As important consequences of ophthalmia tarsi, may be mentioned, tylosis, or chronic thickening of the whole substance ot the lid; lippitudo, excoriation of the edges of the lids, or blear eyes; obliteration of the Meibomian follicles, the cause of incurable lippitudo; madarosis, or loss of the eyelashes; lagophthalmos and ectropium, from the contracted state of the skin, consequent to the healing up of the excoriated lids; trichiasis, or inversion of the eyelashes; distichiasis, or misplaced eyelashes; entropium, from repeated ulcerations of the edges of the lids, and contraction of the cartilages. Several of these sequelæ I shall take up separately.

[1] Lachesis Lapponica, by Smith; Vol. ii. pp. 5, 132; London, 1811.

[2] Treatise on the Diseases of the Eye, p. 339; London, 1833.

[3] Annotazioni Pratiche sulle Malattie degli Occhi; Lib. i. p, 145; Napoli, 1818.

[4] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xxiv. p. 156; Berlin, 1836.

[5] Horatii Sat. I. v. 49.

SECTION XI. — HERPES AFFECTING THE EYELIDS.

There is scarcely any cutaneous disease which may not be seen occasionally on the eyelids.

Herpes I have often met with, both in children and adults. It runs its usual course of about a fortnight, leaving pits, like those of small-pox. Not unfrequently it attacks the cornea, a vesicle having its seat there, ending in an ulcer.

Gentle laxatives and diaphoretics, a light diet, and fomenting the eyelids with warm water, make up the general treatment. Should ulceration take place on the cornea, it ought to be touched with lunar caustic solution, and the eyelids painted over with the extract of belladonna.

SECTION XII. — PORRIGO LARVALIS AFFECTING THE EYELIDS.

Porrigo larvalis, or crusta lactea, not unfrequently spreads to the skin of the eyelids. Infants are almost exclusively the subjects of this disease. It is characterized by an eruption of pustules, followed by thin yellowish or greenish scabs, which often intrude upon the edges of the lids, sealing them up, and preventing the child from opening its eyes. Falling off, these scabs leave the cuticle red and tender, marked with deep lines, and apt repeatedly to exfoliate. The conjunctiva sometimes takes on puro-mucous inflammation during an attack of porrigo larvalis, and occasionally the cornea gives way, and the eye is destroyed.[1] The lymphatic glandular system, in neglected cases, becomes affected, both externally, as under the jaw, and internally, as in the mesentery; diarrhœa and hectic fever follow, and the patient perishes in a state of great emaciation.[2]

Careful ablution of the lids, with some mild and tepid fluid, as milk and water; the solution of nitrate of silver (4 grains to ℥i of distilled water) dropped on the conjunctiva once a-day; and the red precipitate salve applied to the edges of the lids at bedtime, will be found useful; with alterative doses of mercurial purgatives, followed by a course of sulphate of quina.

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[1] Stenheim, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xiv. p. 75; Berlin, 1830.

[2] Bateman's Practical Synopsis of Cutaneous Diseases, p. 162; London, 18 9.

SECTION XIII. — VITILIGO AFFECTING THE EYELIDS.

Fig. Guy's Hospital Reports, Second Series; Vol. vii. p. 274; London, 1850.

This disease, when it affects the eyelids, of which I have met with several instances, presents a row of yellowish, or ochre-coloured, flat patches, of irregular shape, slightly elevated, presenting scarcely any induration, and generally appearing on both sides of the face symmetrically. They are seated in the cutis, and the cuticle covering them seems healthy. They avoid the margins, and appear chiefly in the loose skin of the lids, sometimes spreading slowly to the sides of the nose and to the cheeks. Other parts of the body, as the palms, fingers, elbows, &c., are sometimes affected in a similar manner. The disease sometimes accompanies jaundice, and has been supposed to depend on a defective action of the liver. This should be corrected. The eyelids should be fomented with vinegar and warm water. Benefit has been derived from the repeated application of the nitrate of silver.

SECTION XIV. — ABSCESS OF THE MEIBOMIAN GLANDS.

I have already (page 143) mentioned the occasional occurrence of abscess of the Meibomian glands, as an attendant on ophthalmia tarsi. Idiopathic cases of this kind are also met with, one or more of the glands being turgid with puriform fluid, perhaps without any affection of the edge of the lid, but sometimes with a swelling of its edge resembling a hordeolum. On everting the eyelid, we immediately discover the nature of the case, and the difference between it and common hordeolum. The pus sometimes oozes out, under pressure, at the aperture of the inflamed gland; in other cases, the abscess requires to be opened with the lancet, on the edge or the inside of the lid. In other respects the treatment for ophthalmia tarsi is to be followed.

SECTION XV. — OBSTRUCTION OF THE MEIBOMIAN APERTURES.

Occasionally the external orifice of one or more of the Meibomian ducts becomes covered by a thin film, apparently of epidermis. This prevents the escape of the secretion, which, accumulating, raises up the film into a small elevation, like a phlyctenula. This does not actually cause pain, but gives rise to slight uneasiness when the eyelids are moved. The film is easily broken, and the accumulated secretion removed on the point of a pin.

SECTION XVI. — MEIBOMIAN CALCULI.

Two sorts of concretions are met with in the Meibomian glands. They differ in appearance, and in the direction by which they seek to escape. The one is semi-transparent, like a particle of rice, and soft in consistence. It projects by the orifice of the follicle it occupies, and on pressure starts out. The other is white, opaque, and calcareous; it does not project on the edge, but on the inner surface of the lid, sometimes penetrating through the conjunctiva, and causing great irritation of the eye. For its removal, the conjunctiva covering the calculus requires to be divided with a lancet, or cataract needle, and the concretion lifted out with the pointed end of a probe, or edge of a small spatula. Numerous concretions of this sort are often met with in the same eyelid.

SECTION XVII. — HORDEOLUM.

Fig. Dalrymple, Pl. IV. fig. 1.

A hordeolum, or stye, is a furunculus, or small boil, projecting from the edge of the eyelid. According to some, it implicates merely the cellular tissue; but Zeis suspects[1] that it has its seat in the capsule and glands of the roots of the cilia. Certainly it is not an abscess of the Meibomian glands.

Symptoms. The swelling is of a dark red colour, very hard, attended at first by stiffness and itching, and afterwards by a great degree of pain in proportion to its size. The tension and exquisite sensibility of the skin which covers the edge of the eyelids, serve to explain the vehemence of the pain. The inflammation spreads, in some degree, to the conjunctiva, and the motions of the lids are impeded. In delicate irritable subjects, fever and restlessness are excited. The swelling suppurates slowly, and at last points and bursts. After discharging a small quantity of thick pus, and sometimes a little disorganised cellular membrane, it subsides and disappears. If Zeis be correct, the disorganised substance which is discharged, must be the capsules of the cilia. The cilia fall out from the part affected, to be generally, but not always, reproduced.

Causes. Hordeolum is most frequent in scrofulous subjects. It frequently depends on late hours, the use of spirituous liquors, or on disordered bowels. Pickles and peppers produce it.

Treatment. In the incipient stage, cold applications are to be used, as water acidulated with vinegar, or an iced poultice. If suppuration appears to be advancing, a warm bread and water poultice, inclosed in a little bag of linen, or a roasted apple poultice is to be applied. If slow of bursting, the abscess may be opened with the point of a lancet. The pus and destroyed areolar tissue are to be pressed out, and the poultice continued. It sometimes happens, that the sloughy matter is slow of coming away, in which case the cavity may be touched with a pointed piece of lunar caustic, after which it soon closes.

In the commencement of hordeolum, an emetic, followed next day by a purge, will be found useful.

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[1] Ammon's Zeitschrift für die Ophthalmologie; Vol. v. p. 220; Heidelberg, 1836.

SECTION XVIII.—PHLYCTENULA AND MILIUM OF THE EYELIDS.

Fig. Walton, figs. 88, 89.

Semitransparent vesicles, or phlyctenulæ, filled with watery fluid, frequently occur on the edges of the eyelids, especially at the inner canthus, sometimes single, often in groups, varying in size from that of a mustard seed to that of a pea. Having been punctured with the lancet, their walls are to be laid hold of with a pair of toothed forceps, and snipped off with the scissors.

Small white tumours, like millet seeds, containing a suet-like substance, are often observed on the edges of the eyelids. The are to be opened with the point of the lancet, and their contents pressed out.

SECTION XIX. — WARTS ON THE EYELIDS.

Fig. Dalrymple, Pl. V. fig. 1.

Warts are not uncommon on the external surface of the eyelids, and sometimes grow from their edges. Keeping the excrescence constantly covered with a piece of lint, saturated with a decoction of tormentil root, or a solution of carbonate of soda, will sometimes serve for its removal. But if this does not succeed, the wart may be tied with a waxed silk thread, close to its root; or, if it has a broad attachment, destroyed by the application of lunar caustic. The shortest way is to snip off the excrescence with scissors.

SECTION XX. — SYCOSIS AFFECTING THE EDGE OF THE EYELID.

Fig. Dalrymple, Pl. IV. fig. 5.

To others this may seem a very trifling disease; but to the patient extremely desirous to get quit of it, and to the surgeon who finds it exceedingly difficult to disperse, its apparent insignificance affords little consolation. Other hard tubercles of the same kind are generally present on the face; but the one which is situated on the edge of the lid, or so close to either punctum as almost to surround it, shows a still greater tendency to persist then any of the rest. On the edge of the lid, the tubercle sometimes shoots out with a sharp edge, which may be snipped off with the scissors. A regulated diet, the use of laxatives and antacids, daily touching with sulphate of copper, and warm fomentations, make up the treatment.

SECTION XXI. HORNY EXCRESCENCES ON THE EYELIDS.

Fig. Dalrymple, Pl. V. fig. 2.

The exudation from a sebaceous follicle becoming indurated, and gradually covered by layers of desquamating epithelium, has sometimes pushed itself into the form of a little horn, projecting in a curved form from the skin of the eyelids. Seized with the fingers, the horn is to be drawn forwards, and snipped out by the root.

SECTION XXII. — TUMOURS IN THE EYEBROW AND EYELIDS.

The eyebrow and eyelids are the occasional seats of various kinds of tumours. We shall turn our attention first to those which are common in their occurrence, then to those which are rare.

§ 1. *Chalazion, or Fibrinous Tumour.*

From χάλαζα *a hailstone.* *Syn.*— Tarsal Tumour.

Fig. Dalrymple, Pl. IV. fig. 2. Walton, figs. 90, 91.

This extremely common disease bears some resemblance to a hordeolum, but it is not situated on the edge of the lid, nor does it point towards the edge. It is generally placed at some distance from it, and when it comes to point, it does so generally towards the internal, rarely towards the external, surface of the eyelid. It is situated either between the orbicularis palpebrarum and the tarsus, or in the substance of the cartilage itself. The tumour is at first moveable; but, as it enlarges, it becomes fixed, and the skin covering it grows red. By everting the lid, we cause the tumour to project on its inner surface, which appears inflamed, and often presents a depression over the centre of the tumour. *Fig.* 10. shows the external appearance of the lower lid affected with chalazion; and *Fig.* 11. its inner surface. After the disease has continued for a considerable time, that portion of the cartilage which lies behind the chalazion becomes thinned by absorption, and we find a small fungus-like substance projecting through the cartilage and palpebral conjuctiva. In one case, I found the fungous growth making its way through the upper punctum. A chalazion often goes on to suppurate, or rather suppuration takes place round the tumour, and at length the tumour is destroyed by this process, the abscess evacuating itself, in some cases on the outside, and in others on the inside of the lid.

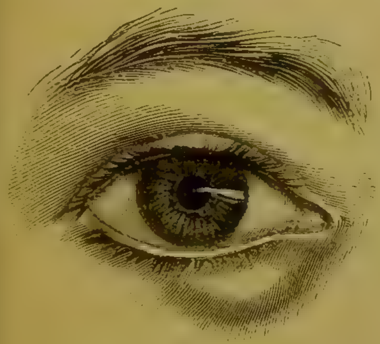

Fig. 10.

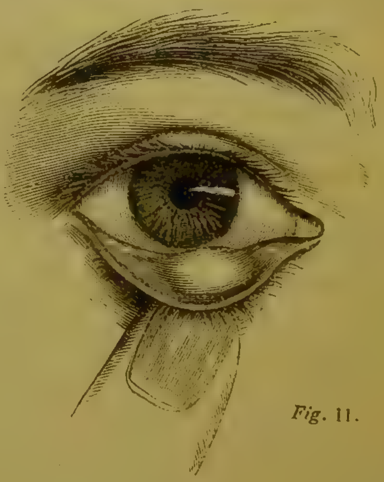

Fig. 11.

Chalazion is met with more frequently in the upper than in the lower eyelid. Sometimes it occurs in both at the same time. In some cases, there are more than one in the same lid. It is very rarely seen in children.

The digestive organs of those who are troubled with chalazia, are generally in bad order; the stomach acid and flatulent; the bowels slow, and the evacuations morbid. In incipient cases, the farther progress of the tumour may often be checked by alterative doses of the blue pill, and by the use of laxatives and tonics, especially bark and steel. Under this treatment, I have seen many such tumours disperse entirely. A vinegar poultice, in a small linen bag, continued every night, sometimes proves useful; as well as friction over the tumour, with camphorated mercurial ointment, for ten minutes twice a-day.

Small hard chalazia should not be touched, especially if situated at the extremity of either lid. When it has attained a certain size and become somewhat softened, this sort of tumour requires to be removed by operation. As it is unencysted, it is needless to think of a regular extirpation. If this be attempted, the operator is very likely to be foiled, as the tumour eludes dissection; or if he still persists, he may extirpate perhaps a piece of the cartilage, and leave the lid with an opening through it, like a button-hole. I have seen cases in which the structure of the lid was materially damaged by attempted extirpations of chalazia; a portion of the cartilage having been removed, leaving the lid inverted, or bound to the eyeball by fræna. All that is necessary, in general, is to evert the affected lid, divide the tumour through its whole length with the lancet pushed through the cartilage, and then press out the gelatinous-like contents. Pretty firm pressure is necessary to effect this. If the tumour, fairly divided, does not start out, the pointed end of a probe may be passed through the incision, the structure broken up, and then pressure applied. The cavity where the chalazion was lodged, immediately fills with blood, keeping up an appearance as if the tumour was still there, although lessened in size; but gradually the swelling, redness, and other signs of the disease, go off entirely. In some few cases, it may be proper to perform this operation through the integuments; but, in general, the tumour lies nearer the inner surface of the lid. If the chalazion threatens to burst through the cartilage, or if there is already a little opening with a small fungous protrusion, the incision ought to be made in the line of this protrusion, and not to one side of it, even though the tumour is more prominent where the cartilage is still entire. It is much easier to press out the chalazion through the thinned part of the tarsus, than elsewhere. If the fungus which protrudes is considerable, it is to be snipped off. Sometimes two chalazia, sitting close together, appear as one; but require two separate incisions for their removal.

Attempts to destroy chalazia by caustic are always ineffectual, and often hurtful, producing induration of the lid, and sometimes trichiasis. A mere division of the tumour through the conjunctiva and tarsus, is also insufficient, even with the application of caustic introduced through the wound; the tumour must be evacuated in the manner described. By this means, the chalazion, if not in a state of suppuration, is generally removed entire. It is of a light reddish colour, and gelatinous consistence, with spots of blood through it. Becoming white and opaque on being immersed in diluted alcohol, dissolving with great ease in acetic acid, and being thrown down by prussiate of potash, it seems to consist of an imperfect fibrinous matter.

§ 2. *Molluscum, or Albuminous Tumour.*

Syn. — Glandiform tumour. Tumeur folliculeuse, *Fr.*

Fig. Dalrymple, Pl. IV. fig. 3. Walton, fig. 87. Willis, Pl. 63.

Molluscum or albuminous tumour occurs much more frequently in children than in adults. It is seated in the skin; sometimes close to the edge of the eyelid, but generally at some distance from it. When close to the edge, the eye is apt to be irritated and inflamed by its presence. The integuments covering the tumour are so thinned as to allow its white colour to shine through. It presents a granulated appearance even before extirpation; and on being removed, is still more distinctly seen to be formed of numerous grains, the acini of hypertrophied sebaceous glands. The tumours vary in size from that of a pin's head to that of a horse-bean, or even larger, are firm, free from pain, unencysted, and not apt to go into suppuration. They are sessile on a contracted base, but not pedunculated. In their centre they present a small orifice, whence a whitish fluid exudes. After a time, the integuments become ulcerated, and the mass is discharged entire, or in portions. The eyelids often present numerous albuminous tumours, and sometimes they are scattered over the other parts of the face.

It is well ascertained, that this disease, when recent, proves contagious, the whitish fluid which exudes by the orifice of the tumour being the apparent medium by which the disease is communicated. In one case, I saw the hands of a gentleman inoculated from the face of his child. The recent disease is styled *molluscum contagiosum*; the chronic, which seems to have lost the contagious property, and has often been known to last for many years, is called *molluscum pendulum,* from the elongation which its attachment to the skin gradually acquires.

Chemical examination of the tumour shows it to possess the characters of coagulated albumen.

If albuminous tumour be dependent on any constitutional cause, it seems of scrofulous origin. I have seen a crop disappear from the eyelids of a scrofulous child, during the use of the sulphate of quina.

Albuminous tumours may be destroyed by being touched with potassa fusa, nitrate of silver, or sulphate of copper; but the readiest way of extirpating them is by a transverse incision through the integuments, and through the diseased mass. By firm pressure with the thumb-nails, placed on the sound skin, we are then able to bring away the tumour entire, without any farther dissection. Sometimes, on making pressure after dividing the tumour, the central parts only of it escape, leaving the exterior layer adhering to the skin, almost like a cyst. By repeating the pressure, this portion is also brought away.[1]

In chronic cases, affecting the upper eyelid, the tumour sometimes attains an enormous size, so as to hang down and completely cover the opening of the lids. In cases of this sort, examples of which are related and figured by Liston[2] and Craigie[3], the rest of the body is generally covered with molluscous tumours. To remove the deformity of the eyelid under such circumstances, an elliptical portion of skin, embracing the diseased structure, requires to be removed, and the edges brought together by stitches.

§ 3. *Encysted Tumour.*

Encysted tumours, filled with serous fluid, or with suety or still more solid substance, rarely occur in the eyelids. Congenital tumours of this kind, however, are not unfrequently met with, close to their outer angle, or above the eyebrow. Their pappy contents are sometimes mixed with short hairs, like cilia, having bulbs, and growing from the inside of the cyst. They often lie under the orbicularis palpebrarum, and adhere to the bone, so that, when we proceed to their extirpation, it is necessary to make a larger incision than the size of the tumour might seem to require, and to dissect carefully round and under the cyst, laying back the orbicularis palpebrarum as well as the integments; for unless this is done, the extirpation will be effected with difficulty. When seated in the eyelids, the cyst is often very delicate, so that it is difficult to remove it entire. If the cyst bursts, we may introduce one blade of the hooked forceps within it, while the other seizes it externally, and go on to dissect out the cyst. In some instances, I have found the cyst seated between the conjunctiva and the orbicularis palpebrarum, so as to be beyond the tarsus; and in this case, the extirpation is best accomplished through the inner surface of the lid.

Instead of attempting a regular extirpation, it may sometimes be advisable merely to lay open the cyst with the lancet, and then squeeze out its contents, along with the cyst, which I have sometimes accomplished. If the cyst cannot be thus brought away, we may introduce into its cavity for a few seconds a pencil of lunar caustic, or pure potash. After a few days, the cyst comes away, and the wound heals up. Or the tumour may be divided at once into two halves, the contents removed, and the cyst allowed to collapse; then, with a pair of forceps, the one half of the cyst is to be laid hold of, drawn out through the wound, and snipped off with scissors, and the same with the other half. If any part of the cyst is left, the wound will perhaps not close, or is apt to open again, after being healed, and continue for a length of time to discharge matter. Should this take place, it may be proper to make an incision, and remove the bit of the cyst which had been left at the former operation.

Simple puncturing of encysted tumours does not answer well, as it is apt to excite inflammation in the neighbouring cellular membrane, and lead to fungous growths from the cyst.

§ 4. *Fibro-plastic or Sarcomatous Tumour.*

Case 136.—A moor, 24 years of age, applied at the French Hospital at Algiers on account of an enormous nodulated tumour in the right upper eyelid, of several years' standing, the origin of which he attributed to a blow with a stick. The tumour hung down so far, that the cilia were nearly on a level with the chin; it rose in relief above the prominence of the nose, and measured 6 inches in its vertical diameter, and 5 in its transverse. The upper part of the tumour passed into the orbit, and adhered to the globe of the eye, which was partially atrophied, with its cornea opaque. When the tumour was raised, however, the patient appeared to discern the light.

The patient was much harassed by this morbid growth; it deranged his whole system, disturbed his nutrition, and had reduced him to a state of great emaciation. M. Baudens, the surgeon of the hospital, explained to his colleagues how he should dissect out the tumour from below upwards, leaving a sufficient portion of integuments to supply the loss which the conjunctiva would suffer, and avoiding in his operation the orbicularis palpebrarum, the levator palpebræ superioris, and the cartilage of the lid. His opinion was adopted, but the operation was more troublesome than he had calculated, chiefly from the unmanageableness of the patient.

The nodules of the tumour were interspersed among the fibres of the orbicularis palpebrarum; and the operator felt his difficulties augmented when he came to separate the diseased structure from the eyeball, which he was most desirous not to injure. He contrived to manage it, by using his forefinger as a guard between the eye and the tumour; and syncope having come on, he availed himself of the moment to dissect the integument, which he wanted for the new eyelid. To this he attached the edge of the old eyelid, by a few stitches, thus preserving the cilia. Simple dressings were then applied. In 24 hours, the sutures were removed, the cicatrice being consolidated. In eight days, the patient was almost quite well. In the course of two months, the cornea recovered a great part of its transparency. The lid could be raised and depressed, and its dimensions nearly corresponded with those of the opposite side.

As to the tumour, it was found strongly imbedded in a fibrous envelope, several lines in thickness. It weighed 15 ounces, and resembled, in every respect, a mass of pale fibrin, such as is obtained from abstracted blood. A number of little serous cysts were seated in its centre.[4]

Other tumours, still, might be described; for example, neuroma or painful subcutaneous tubercle, scirrhus, fungus hæmatodes, melanosis[5], &c. But I think it unnecessary to enter on the particular consideration of these diseases as affecting the eyebrow or eyelids.

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[1] On Molluscum, consult Paterson, Edinburgh Medical and Surgical Journal; Vol. lvi. p. 279: Turnbull, Ib. p. 463: Cotton, Ib. Vol. lxix. p. 82: Caillault, Archives Générales de Médecine, 4e Série; Tome xxvi. pp. 46. 316; Paris, 1851.

[2] Lancet, July 13, 1844, p. 489.

[3] Edinburgh Medical and Surgical Journal; Vol. lxxv. p. 108; Edinburgh, 1851.

[4] Baudens, Clinique des Plaies d'Armes à Feu; p. 168; Paris, 1826.

[5] Edinburgh Surgical and Medical Journal; Vol. xxxviii. p. 324; Edinburgh, 1832.

SECTION XXIII.—TYLOSIS, OR CALLOSITY OF THE EYELIDS.

There are several varieties of thickening and induration of the eyelids, which merit attention. What I said in former editions of this Work, of the scirrhoid, I have transferred to the head of epithelial cancer. (See p. 134.) There remain the scrofulous, and the arthritic varieties.

1. The former arises, as has beeen already (page 143) explained, from neglected ophthalmia tarsi. Iodide of potassium or Plummer's pill failing to remove it, a caustic issue in the nape of the neck is perhaps the best remedy for this, the *scrofulous tylosis,* added to the ordinary treatment of inflammation of the edges of the eyelids.

2. *Tylosis arthritica* rarely occurs, except in those whose digestive organs are deranged by the habitual use of ardent spirits. It is attended with redness, attacks generally the upper eyelid, and seems to have its chief seat external to the cartilage. The whole

length of the eyelid is commonly affected; but in some cases merely a part, and that not unfrequently the neighbourhood of the papilla lacrymalis. Occasionally the Meibomian glands are evidently enlarged; and sometimes the disease is combined with chalazion. I have never seen this variety of callosity end in suppuration or ulceration. It slowly increases, and then becomes stationary. The patient generally complains of thirst, acidity, and want of appetite. The application of leeches, friction with camphorated mercurial ointment, the use of laxatives, and the exhibition of alteratives internally, I have sometimes found successful, but often fruitless, in this complaint.

SECTION XXIV.—NÆVUS MATERNUS, AND ANEURISM BY ANASTOMOSIS[1], OF THE EYEBROW AND EYELIDS.

Syn. — Mother's mark, *Vulg.* Loupe variqueuse, *Petit.* Tumeur erectile, *Fr.* *Incorrectly called by some French authors*, Fongus hématode. Der Blutschwamm, *Ger.* Telangiectasia, from *τέλος end*, *ἀγγεῖον vessel*, and *ἔκτασις extension.*

Fig. Bell's Principles of Surgery, Vol. i. p. 461; Vol. iii. Nos. 56, 57, pp. 261, 222. Burns' Surgical Anatomy of the Head and Neck, Pl. VIII. fig. 1. Walton, fig. 73.

Although it strictly comprehends every sort of congenital mark, such, for example, as that called *mole*, the term *nævus maternus* is generally used to signify only a particular kind of anastomotic or erectile tumour.

It seems to be the common opinion, that anastomotic tumours, whether *congenital* or *acquired*, consist, in a great measure, of dilated blood-vessels; and that, in some cases, these are chiefly *venous*, and in others chiefly *arterial*. Tumours of the latter sort are, in fact, *aneurisms by anastomosis*, and are characterised by their rapid and dangerous course, continual and distinct pulsation, and the great dilatation, tortuosity, and throbbing of the arteries which supply them; while the former, usually called *nævi*, are without pulsation, and are generally slow in their progress. Both sorts give out arterial blood on being punctured. If they are situated on the head, both sorts become suddenly tense, as if ready to burst, when the patient stoops, or if he is exposed to much heat, indulges in violent exercise, or is under the influence of mental excitement. If the patient be a child, a nævus assumes this state of distention when it cries. The terms *venous* and *arterial*, applied to these two varieties of tumour, may be incorrect; for we are, as yet, in a considerable measure ignorant of the real structure of anastomotic growths, and cannot, therefore, pretend perfectly to explain their nature. The appellations *passive* and *active* seem less objectionable. When laid hold of, the passive have a peculiar dough-like feeling, yielding slowly to pressure, till they seem empty and flaccid, then filling up almost immediately to their former size; the active, on being touched, give the impression of a violent pulsatory movement, and can scarcely be emptied by the fingers, unless the large vessels whence they derive their blood, be at the same time firmly compressed.

On dissection, a nævus is found to consist of lobes, and these internally to be formed of irregular cells, or loculi, communicating together. The walls of these cavities, as well as the exterior covering of the lobes, are fibrous. The relation of these cavities to the arteries has not been satisfactorily made out; but with the veins the reticular texture of the lobes freely communicates; and a general resemblance to the structure of erectile tissue is manifest. If the resemblance is real, the nævus must be destitute of capillaries, and therefore the blood must pass through it with increased rapidity.[2]

The distinction of *cutaneous, sub-cutaneous,* and *mixed* nævi, is of considerable importance. In the first, the disease appears to be seated entirely in the skin, which is sometimes of a scarlet colour; in the second, the integuments covering the tumour, not being at all implicated in the disease, can be pinched up from off the diseased mass, and the nature of the case may be obscure; in the third, both the skin and the subjacent areolar tissue are involved, and the surface presents a purple or livid colour. Owing to the resisting texture of the skin, the progress of the cutaneous is slower than that of the other varieties. The limits of the sub-cutaneous and mixed are much less defined than those of the cutaneous.

In the eyelids, there occur both venous or passive, and arterial or active nævi, both cutaneous, sub-cutaneous, and mixed. In one case which I saw, the tumour was most prominent on the conjunctival surface of the lid; and it sometimes happens that the disease does not affect the lids or brow merely, but stretches deep into the orbit. Not uncommonly, we meet with a small nævus on the lids, and one or more larger ones, on the scalp, trunk, or extremities. The branches, however, of the external and internal carotids are much oftener concerned in anastomotic tumours than any other arteries.

In some instances, in which the disease occurs on the lids or their neighbourhood, the place affected is from the first of a bright scarlet colour, and whether flat or slightly prominent, whether smooth like a cherry, or granulated like a raspberry, is probably cutaneous merely. In other instances, the integuments, in the seat of the disease, appear at birth merely a little puffy, but after a time, they become doughy, livid, and swollen, while through them there shines a collection of dilated blood-vessels. In this case, the disease is subcutaneous.

Prognosis. Some nævi, through vivid at birth, spontaneously disappear. Those of the venous sort especially, after having increased to a certain degree, sometimes cease to enlarge, or gradually wither and contract, till scarcely a vestige remains. Any means applied immediately before the commencement of such spontaneous atrophy, is apt to get the credit of having effected a cure. Any severe illness, reducing the general powers of nutrition, as measles, hooping-cough, or bronchitis in infants, promotes the natural cure. Some nævi, having attained a certain size, remain stationary through the rest of life, although varying in intensity of colour at different seasons, and according to different conditions of the circulation. Although abundantly supplied with blood, nævi often appear to be endowed with a low degree of vitality, so that some slight injury will cause them to ulcerate and slough; and being in this way partly destroyed, the remainder becomes consolidated, and the disease is thus prevented from increasing. Another set commence to spread, either immediately after birth, or from incidental causes, at some subsequent period; advancing slowly but steadily, they form complicated and dangerous connections with neighbouring parts, not at first involved, and from small beginnings, become vascular tumours of great extent, and not unfrequently formidable from partaking of the nature of the cases so well described by Mr. John Bell, under the name of *aneurism by anastomosis*, apt to burst, and to give rise to impetuous hæmorrhages, which, if they do not prove suddenly fatal, materially injure the health.[3] A nævus on one or other eyelid may be at birth no bigger than a pin's head; but in a month's time, may spread to the third of an inch in diameter. Some very slight cause of irritation, as a trifling bruise, will sometimes excite a mere stain-like speck, or minute livid tubercle, into an uncontrollable state of diseased action. The passive nævus has been known to assume the character of the active, and *vice versâ*.

Case 137.—In a case recorded by Pauli, a nævus occupied the upper eyelid close to the external angle of the eye, and at birth was of the size of a lentil. The lid, a little redder than the rest of the skin, hung over the eye; but after some days, it assumed its proper situation. In nine months, the tumour was as big as a duck-egg. Towards the third year, it covered the eye almost completely, and went on extending itself under the skin in every direction. At nine years, it occupied completely one half of the face and head, and displaced the ear upwards. Two years after, it hung so much upon the face, that the little patient was obliged to have it supported in a bag. The cartilage of the nose was twisted to the other side, and the tumour was gaining upon the cavity of the mouth.

When Pauli saw the case, the patient being 15 years of age, the tumour was elastic, soft, bossulated, and apparently fluctuating; it could easily be compressed, and frequently, on placing the hand upon it, it communicated a pulsation, which diminished a little on compressing the corresponding arteries, but did not disappear completely. Every change of weather affected the tumour with pain; abrasion of it caused it to bleed.[4]

Treatment. Various methods of treating nævus or aneurism by anastomosis have been adopted. The principle of some of them is the obliteration of the abnormal structure by inflammation; that of others is the total destruction or removal of the tumour. Our choice must be regulated by the situation of the growth, its size, and its degree of activity. Other things being equal, the methods which leave the skin entire, so that no ectropium is likely to ensue, claim a preference when the disease is seated in the eyelids.

If a nævus is small, superficial, and not increasing, we may be tempted to let it alone, or to cover its surface every second or third day with collodion, which, as it dries, causes a certain degree of contraction, or to pencil it daily with tincture of iodine, or a solution of lunar caustic. If it fades away under such applications, the probability is, that we are merely aiding in a spontaneous cure, which would have occurred, even had nothing been done.[5] If the tumour, on the other hand, is evidently increasing, there should be no delay in having recourse to some efficient mode of treatment.

1. *Abstraction of heat, pressure, and astringents.* A moderately

sized nævus above the eyebrow, or in any other situation permitting it to be emptied by pressure against a subjacent bone, may, in general, be cured by continuing the pressure methodically. This is best effected by a pad, connected with a steel spring passing round the head. This plan I adopted successfully, in a case of nævus situated between the nose and the inner canthus. Boyer relates the case of a child, of two years of age, with this disease in the upper lip, the cure of which was effected by preseverance in the plan of pressure. The nævus extended from the adherent edge of the lip, under the nostrils, and into the septum narium; so that a complete extirpation being, in Boyer's opinion, impossible, he advised the mother to bathe the tumour with alum water, and with her forefinger placed transversely under the nose, to compress the part as often as she could. This advice was followed with a degree of constancy which maternal tenderness only could have accomplished. The mother sometimes passed seven hours continuously, in pressing the tumour with her finger; and this assiduity was attended with such complete success, that ultimately no trace of the disease remained.[6]

Mr. Abernethy, after mentioning the particulars of an aneurism by anastomosis on the fore-arm, cured by permanent and equal pressure, and by keeping low the temperature of the limb, relates the following case:—

Case 138.—A child had this unnatural state of the vessels in the orbit. They gradually increased in magnitude, and extended themselves into the upper eyelid, so as to keep it permanently closed. The clustered vessels also projected out of the orbit, at the upper part, and made the integuments protrude, forming a tumour as large as a walnut. The removal of this disease did not appear practicable, and pressure to any extent was evidently impossible; but the abstraction of heat, and consequent diminution of inflammatory action, might be attempted. Mr. Abernethy recommended that folded linen, wet with rose-water saturated with alum, should be bound on the projected part, and kept constantly damp.

Under this treatment, the disorder as regularly receded as it had before increased. After about three months, the tumour had gradually sunk within the orbit, and the child could open its eye. Shortly afterwards all medical treatment was discontinued, and no appearance of the unnatural structure remained.[7]

In flat nævi, up to the size of a crown piece, Dieffenbach tells us, that much may be done by a careful employment of astringents, such as pure liquor plumbi, or a solution of alum, even without pressure. Lint, steeped in the fluid, is fastened over the part with a bandage, and frequently wetted, without lifting it. After days, or weeks, the swelling becomes whiter, flatter, and firmer; soon after, little firm white spots form on the surface, and the cure is certain. By means of solution of alum and compression, Dieffenbach has cured nævi so large, that extirpation would have been impossible. It may be necessary to keep the solution constantly applied for six months.[8]

From the nature of the situation, the plan of treating nævus on the eyelids, by pressure and astringents rarely succeeds; and the delay occasioned by giving it a trial, may prove highly detrimental. When a cure does follow this sort of treatment, it is probably accomplished more by nature than by the artificial means employed. In one case, in which I used a saturated solution of alum, the fluid, by getting into the eye, occasioned a pretty severe puro-mucous ophthalmia.

The application was discontinued, and after some months a natural cure took place. Brandy is said to have been tried with good effect, as an astringent application.

2. *Vaccination.* Small, and sometimes even extensive, cutaneous nævi have, in their early stage, been cured by the application of vaccine lymph. The principle upon which this method of cure depends, is the destruction, by suppuration, of the abnormal tissue. With a lancet already charged with the recent lymph, slight scratches are made upon the surface, and round the circumference of the nævus, at regular distances from each other. As soon as the bleeding has ceased, additional lymph is to be introduced; and then over the whole surface of the tumour, a bit of linen, saturated with the same fluid, is to be applied, and retained for several hours. In the usual time, vesicles appear. Each produces a degree of inflammation, which induces an occlusion of the næval cells and vessels only to a certain distance around it; and therefore it is necessary to inoculate the surface of the tumour at such close distances, that the whole lobes of which it consists, may be involved in the inflammation. In favourable cases, the tumour gradually subsides, leaving scarcely any mark behind. Not unfrequently the cure is effected, however, only after a very tedious festering and ulceration. If the child has been vaccinated in the common way, previously to the nævus attracting much notice, this plan of cure will rarely succeed; and even in children not previously vaccinated, it often fails to accomplish the object intended.[9]

3. *Stimulants.* When vaccination has failed, or vaccine lymph cannot be procured, some other stimulating fluid may be tried, inserting it into the nævus in the same way as we do the lymph. A strong solution of tartrate of antimony may be used for this purpose; or a pustular eruption, affecting the nævus to a sufficient depth, may be excited by rubbing it with tartrate of antimony ointment, or covering it with an antimonial plaister. It is likely that vaccine lymph produces no specific effect upon this sort of tumour, but operates merely by inflaming the part; and that any other stimulant of proportionate energy, and applied with equal care, would be followed by the same result, especially if the disease were merely cutaneous. Croton oil appears to have answered.[10]

4. *Escharotics.* Both fluid and solid escharotics have been used, to destroy the organization of nævi. Some employ lunar caustic. For a small cutaneous nævus, painting the surface of it with a bit of wood, dipped in strong nitric acid, answers well. Dr. Ammon touches the tumour from time to time with a solution of the nitrate of mercury in nitric acid.[11] Mr. Wardrop has repeatedly employed pure potash, applying it to the nævus so as to produce an eschar. In some instances, the eschar, on falling out, has been found to comprehend the whole diseased mass; while, at other times, the separation of the eschar has been followed by ulceration, which destroyed the remainder of the tumour.[12] These were cases, we may presume, of the sub-cutaneous or mixed kind. The potash is to be rubbed only on the centre of the tumour. Ulceration follows, and spreads, destroying the nævus. A poultice is applied, the parts fall out, and

circatrization takes place. The potash may require to be applied, however, four or five times before the object is obtained.

"I have seen cases," says Liston, "in which most profuse and alarming hæmorrhage had followed boring into erectile tumours, with strong potential cauteries, and in which, after all the pain, danger, and delay, no benefit accrued from the practice."[13] It is for cutaneous cases chiefly, that escharotics are adapted. When the eyelids are concerned, the contracted cicatrice, which is apt to be left after the destruction of the tumour is accomplished, renders this method of cure objectionable.

5. *Injections.* Mr. Lloyd[14] proposes to inject into the substance of the nævus some stimulating, or even escharotic, fluid. He tried a mixture of the spirit of nitrous ether with nitric acid. By repeated injections, one portion of a large nævus on the face and eyelids was destroyed; but the child took measles before the cure was completed, and died. The injection did not enter very readily; therefore, much could not be accomplished at once. In another case, it passed freely into the substance of the nævus, and five injections accomplished a cure. The effect of the injection was the hardening of the part into which it entered; and as the hardness subsided, the disease disappeared.

A solution of perchloride of iron has been recommended as a fit injection, from its power of coagulating the blood in the vessels; and a particular sort of syringe has been invented for injecting it.

The point of the syringe should be introduced through an aperture in the skin, at some little distance from the disease, as it is then easier to stop the bleeding by compression. Before injecting, the nævus should be compressed, so as to empty it of its blood, and the pressure continued till the instant when the fluid is projected by the syringe. The fluid should be retained in the nævus from five to ten minutes, by making pressure along the track which had been occupied by the tube of the syringe.

Mr. Lloyd warns us to make pressure around the nævus during the act of injection, lest the fluid be forced into the contiguous cellular tissue, where it might excite inflammation. For making the pressure, he recommends the cover of a pill-box, with a notch in it for the passage of the point of the syringe.

A much more serious accident, however, than the injection of the cellular tissue is apt to attend this method of treating nævus; namely, the passage of some of the fluid into the veins, and thence into the heart. There is strong reason to suspect that this was the cause of instant death in a child nearly two years old, in whom a nævus, situated over the angle of the jaw, was injected with diluted aqua ammoniæ.[15]

6. *Actual cautery.* Another mode of producing inflammation, and thereby obliterating the tumour, is by the actual cautery. The centre of the tumour is touched with the red-hot iron; or a number of long sewing needles, heated to a white heat, are pushed across the tumour in different directions, so as to cauterize every part of it.[16] Platinum wires are put through the nævus in different directions, and heated to a red heat, by being connected with the poles of a galvanic battery. Small sloughs form at the points where the wires penetrate the skin. The operation may require to be repeated.[17]

7. *Sub-cutaneous incision of the vessels within the tumour.* The danger of hæmorrhagy from excision, the pain of the ligature, and the extensive scar left by vaccination, induced Dr. Marshall Hall to consider whether some less objectionable operation might not be devised for the cure of nævus. Accordingly, he proposed to introduce a couching-needle with cutting edges, at one point of the circumference of the nævus, close by the adjoining healthy skin, and from this point to pass the instrument through the tumour in 8 or 10 different directions. The first puncture, the only one through the skin, is to be made in the centre of the several rays of incisions, which are effected by merely withdrawing, and again pushing forward the instrument. This operation was tried, under Dr. Hall's direction, in a case of oval nævus, rather larger than a shilling, the situation of which, however, he does not mention. After the incisions were made in the manner described, a little pressure was applied on the tumour, by means of strips of adhesive plaister. There was no pain, nor hæmorrhagy. Dr. Hall expected that inflammation would take place, and that a cicatrice would be formed, which, from its solid texture and progressive contraction, would obliterate the tumour. For several weeks there was little or no change. Indeed, it was almost concluded that the plan had failed. What a short time, however, did not effect, a longer period accomplished completely. Half a year after the operation, the tumour was found to have disappeared, and the colour of the skin to be nearly natural.

Dr. Hall observes, that this operation may be repeated at longer or shorter intervals, and with more or fewer punctures, according to the degree of inflammatory action necessary for the obliteration of the nævus. He adds that pressure forms no necessary part of the treatment; and that the cure in the case detailed was gradually effected, long after pressure had ceased to be employed.[18]

8. *Sub-cutaneous incision combined with cauterization.* With a knife about $\frac{1}{8}$ inch broad, Sir B. C. Brodie cuts up the interior of the nævus, in the mode recommended by Dr. Hall, and then introduces a silver probe, coated with nitrate of silver, into the cuts. This causes sloughing of the interior of the nævus, but does not destroy the skin. If the tumour is large, the operation will require to be done more than once.[19] This is one of the methods of cure best adapted for nævus of the eyelids.

9. *Seton.* The cure of nævus by the passage of a seton through the tumour, as proposed by Mr. Fawdington of Manchester, is tedious. The saving of deformity is its great recommendation, little more remaining than the scars produced by the needle.

In employing the seton, it is necessary to secure two material objects; namely, the suppression of hæmorrhagy from the vessels divided by the needle in the first instance, and subsequently a degree of irritation sufficient to excite inflammation and suppuration throughout the diseased mass. The first of these objects is accomplished by using a skein of spongy cotton-thread, large enough fully to occupy the aperture made by the needle; and the second, by a needle that will admit, relatively to the dimensions of the tumour, a seton of considerable proportions.

The seton is commonly directed to be passed through the tumour; but Mr. Lizars directs the tumour to be raised with the fingers, so that the needle may pass completely under and free of it. In this way, the seton is more likely to cause obliteration of the vessels leading to the tumour; for when passed through the diseased mass, the vessels leading to it rapidly reproduce that which has been destroyed.[20]

In treating nævus in the eyelids or their neighbourhood, with the seton, several threads ought to be passed through or beneath the tumour, parallel one to another, and their ends tied together so as to prevent them from slipping out. If the irritation which follows, seems insufficient, thicker threads should be passed, and additional ones may be introduced in a transverse direction to the first. When the suppuration becomes abundant, the threads should be reduced in thickness, to allow the pus freer exit. The threads must be persevered in, till the tumour shrinks, and seems to be becoming consolidated. The object in view may be promoted, by occasionally passing a probe, coated with nitrate of silver, through the channels formed by the threads.[21]

10. *Ligature.* The ligature is employed in the treatment of nævus, either, 1. To excite inflammation, and consolidate the parts only; or, 2. To destroy them and make them slough. It is used, also, either to grasp and cut through the skin as well as the tumour; or to strangulate and destroy the tumour, but leave the integuments nearly entire. It might be supposed, perhaps, that only the latter mode of using the ligature would be answerable when the lids are the seat of the disease, owing to the contraction which must result when the skin covering the nævus is destroyed. I have found, however, that nævi on the lids, especially on the upper lid, unless very extensive, may be treated with the ligature in the common way, without much risk of producing ectropium.

One mode of using the ligature is the following:—The tumour being laid hold of with the finger and thumb, so as to raise it as much as possible from the proper substance of the lid, two or more slender pins are passed under it, so as to intersect each other; the ligature is then placed around the base of the tumour, under the pins, and being drawn tight, is tied.

Another method is, to pass a common curved needle, or a curved needle fixed in a handle, and having an eye near its point, which is called a nævus needle, armed with a strong waxed linen thread, through the base of the tumour, so as to divide it into two portions. The thread being cut, and the needle removed, each portion of the tumour is to be grasped by its own ligature. If the tumour is very large, it may be divided into four portions, by passing the needle, armed as before, a second time, but at right angles to its first direction. The ligatures are to be drawn tight, and secured by a double knot. In the following method, the common needle may be used, and there is no liability to mistake the threads to be tied:—Blacken half the length of a long white thread with ink, and thread a wide-eyed needle with it. Transfix the tumour in the common way, and cut the bow so as to keep the black thread in the needle. Then thread the needle also with the white end, which has not passed through the tumour, and transfix the tumour at right angles to the former direction. Draw the white ends tight and tie them; then, the black. Each thread includes a figure of 8 portion of the tumour, as is shown in *Fig.* 12. The dotted lines show the course of the threads under the tumour.

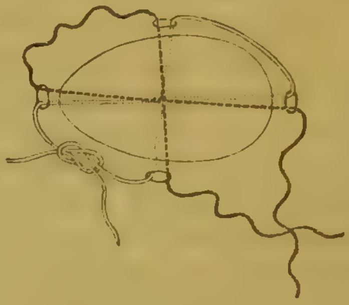

Fig. 12.

If any part of the tumour slips from the grasp of the ligature intended to embrace it, a needle must be thrust under that part, and held there till the knot is tied, or left till the tumour separates. After the ligatures are drawn tight, but before they are tied, it may be advisable to divide the skin round the base of the tumour, so as to allow the ligatures to sink into contact with the tumour. After the ligatures are tied, the tumour may be punctured, so as to diminish its bulk. Care must be taken, in whatever way the ligature is applied, that no part of the tumour is excluded from its embrace, as any small portion that is left may give rise to a reproduction of the disease.

In the course of 48 hours, the tumour will have entirely lost its vitality, so that it may be sliced off, and the ligatures removed; or it may be left till it turns black, shrivels, and falls off, which, in nævi of the eyelids, generally happens in five or six days. A poultice is then to be applied, and continued till the exposed surface granulates and heals. Occasionally it requires to be touched with lunar caustic.

Some very extensive and irregular nævi, stretching over the neighbouring parts as well as the eyelids, may require more than two ligatures. For such cases, Mr. Luke's method of applying the ligature will sometimes be found answerable. He threads several straight or curved needles, at distances from each other of about 12 inches, with one long thread, the number of needles corresponding to the size of the tumour. The needles are passed in a row, under the nævus, as is represented in the diagram, *Fig.* 13; they are then removed, by cutting the ligature near to the eye of each; and the succession of loops is tightened by tying *a* with *a*, *b* with *b*, *c* with *c*, and so on, till the whole tumour is strangulated.[22] The same thing may be done, as Mr. Curling has shown, with the nævus needle.[23] Besides the perfect strangulation which this plan affords, it lessens the puckering and drawing in of the surrounding integuments which must always, in some degree, follow the use of the ligature, but which it is material to avoid when the eyelids are the seat of the disease.

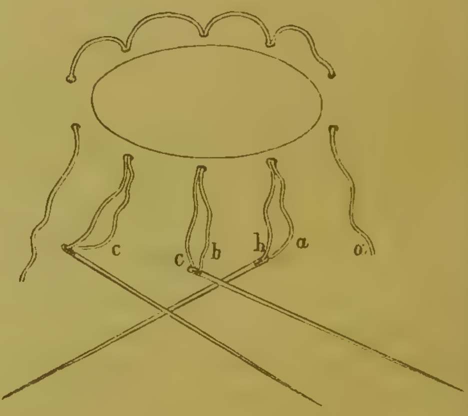

Fig. 13.

If the nævus is entirely sub-cutaneous, the skin, as Mr. Liston[24] advises, may be divided and turned aside, so as to expose the tumour, to which the ligatures are then to be applied.

I may here notice M. Lallemand's modes of treating nævus. Sometimes he inserts a number of pins into the tumour, without transfixing it, and twists a waxed thread around the pins. In other cases, he transfixes the tumour with a great number of pins, in every direction, and then applies the ligature, so as to strangulate the tumour. . In whichever way they are applied, he removes the pins and ligature in seven or eight days, or when they are thought likely to have excited sufficient inflammation to consolidate the morbid structure. In this way, there is no loss of integuments. Occasionally, he makes an incision through the whole substance of the nævus, and immediately unites the two lips of the wound by needles and the twisted suture. The inflammation and the cicatrice which follow, obliterate the tumour.[25]

When we are anxious to save the skin, the ligature may be applied sub-cutaneously. This is done in one or other of two ways.

In the one method, the ligature is passed, by means of the common curved needle, or the nævus needle, round as much of the basis of the tumour as can be conveniently accomplished by a sweep of the instrument, as from A to B in the diagram, *Fig.* 14, and brought out through the skin at B. Again armed with the same ligature, the needle is re-introduced at B, and carried round either the whole remainder of the tumour, or round a portion of it only, according to its size. Suppose it is carried round to C, and there brought out, the needle, again armed with the ligature, is re-introduced at C, and carried round to A, where the two ends of the ligature will emerge, after it has encircled the whole basis of the tumour. The dotted line in the diagram shows the course of the sub-cutaneous ligature, which is now to be drawn tight, and secured by a double knot.

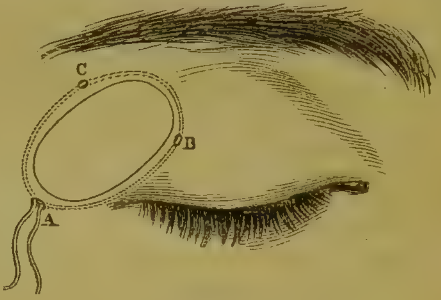

Fig. 14.

In the other method, the needle, armed with a ligature, is passed transversely under the tumour, from the one side of its base to the other, as from A to B, in the diagram, *Fig.* 15. The loop is then cut, and the needle relieved. Armed as usual, the needle is now swept round, first, the one half of the basis of the tumour, as in the course of the dotted line B C A; and then round the other half, as in the course of the dotted line B D A. Each half being now surrounded by its own ligature, first the one, and then the other ligature is to be drawn tight, and tied at A.

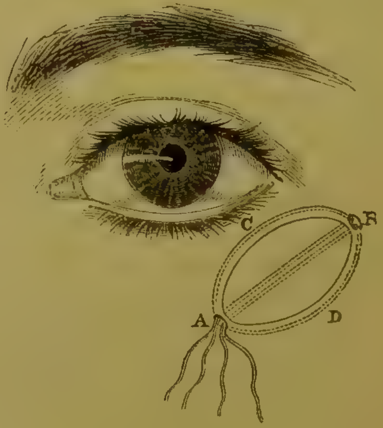

Fig. 15.

The sub-cutaneous ligature, applied in either of these two methods, if it is to be left till it comes away of itself, requires to be tightened from day to day. The orifice by which it emerges, allows a discharge of matter for some time, and a slough is occasionally withdrawn from the cavity formerly occupied by the morbid growth.

Mr. Startin connects the ligature to a band of vulcanized caoutchouc; and through its means exercises an elastic tension, which gradually brings the ligature away.[26]

Some practitioners allow the ligature, whether it is applied over or under the skin, to strangulate the tumour only for a day or two; they then withdraw it. This temporary application suffices, perhaps, to produce a certain degree of inflammation, but no slough. This plan is apt to fail, the disease again increasing after the irritation has subsided. To insure a cure, astringents and pressure should be employed, after the ligature is removed.

The sub-cutaneous ligature has been found to cure, not only the sub-cutaneous variety of the disease, but also the mixed. Sometimes it fails, from not sufficiently interrupting the flow of blood into the tumour, through the vessels of the skin.[27]

11. *Tying the vessels of supply.* In cases of aneurism by anastomosis, large arteries are felt throbbing strongly round the tumour. These vessels of supply have often been tied, in the hope of causing the tumour to shrink; but the practice is not to be recommended, as it has generally proved totally ineffectual. As soon as one vessel is obliterated, another anastomosing branch becomes enlarged, and an equally copious supply of blood is sent to the tumour. Cases 139 and 142 will illustrate the inefficacy of this plan of treatment.

12. *Excision.* Nævi and anastomotic aneurisms have been removed by excision. This is an effectual, but by no means a very safe mode of cure.[28] When the morbid growth itself is cut, a powerful gush of arterial blood takes place, which can hardly be restrained; and although the knife keeps clear of the tumour, there is, in general, very serious hæmorrhagy, so that in removing even small nævi in this way, alarm has justly been excited for the life of the patient, and the recovery of strength and colour has been very tedious. Yet, according to Dieffenbach[29], extirpation of nævi, and union of the edges of the wound by pins and the twisted suture, is the best method of all, when astringents fail. He extirpates the tumour totally or partially, according to its size. If partial extirpation is employed, an oval slip of the tumour is excised from the middle; and when the wound so produced has healed, another piece is excised; and so on, till the whole has been removed. Piecemeal extirpation, in this way, may, perhaps, answer in cases of passive nævi; but would be quite inapplicable in such an active tumour as was present in the following case: —

Case 139. — A gentleman of about 25 years of age, had an aneurism by anastomosis upon his forehead. It began with a small spot like a pimple, of the size of a pea; and was, when he consulted Mr. John Bell, of the size of an egg. It was seated close upon the eyebrow, and at its commencement was so small, and so little troublesome, that it was believed to be a pimple, brought on by a tight hat. When it had attained the size of a sparrow's egg, the patient thought he felt occasional pulsation in it. He consulted a surgeon, who found the pulsation distinct, pronounced it to be an aneurism, and advised that it should be cut out. The patient delayed, and was recommended by some one to try pressure. This producing pain but no good effect, he let the aneurism grow for five years.

An operation was now decided on. The tumour appeared to derive its blood from two arteries; one, a branch of the temporal, enlarged and tortuous, which passed into the upper end of the tumour, while the other, coming from within the orbit, entered the lower end. These two arteries and the intermediate tumour beat in concert, and very strongly. Under the apprehension that the disease was merely an enlarged artery, the surgeon first passed a ligature round the arterial branch coming from the orbit, and tied it; but this did not abate the pulsation of the aneurism. He next tied the temporal branch, but the pulsation remained unaffected. The tumour was then laid open in its whole length. It bled very profusely. A needle, armed with a ligature, was stuck into its centre, where there was one artery larger than the others; but from all the rest of the surface there was one continual gush of blood. The hæmorrhagy was repressed, and the wound bound up with a compress and bandage. It healed slowly, the ligature came away with difficulty, the pulsation began again, and by the time the wound was healed, the tumour was as large as before the operation.

For nine months the patient allowed the disease to go on unmolested, and then consulted Mr. Bell. The tumour was of a regular oval form, and across the middle of it ran the scar of the operation. The spot was not purple on its surface, but was covered by a firm sound skin. The two arteries were felt pulsating with great force; and when the patient was heated, stooped, or breathed hard, the pulsations became very strong. By this time it was affected also with pain. Mr. Bell knew, that if he cut within the active circle of the tumour, he should have innumerable blood-vessels to contend with. He therefore resolved to cut out this aneurism, not to cut into it. He made an oval incision, which comprehended about a fourth part of the surface of the tumour, dissected the skin of each side down from it rapidly, went down to the root of the tumour, and turned it out from the bone. It bled furiously during the operation, but the moment it was turned out, the bleeding ceased. The two arteries were tied, the eyebrow was brought nicely together, and the incision healed in 10 days. The tumour appeared a perfect cellular mass, like a piece of sponge soaked in blood.[30]

This, then, is an example of the sub-cutaneous arterial aneurism by anastomosis, and of the mode of cure by excision. The following case, related by Mr. Allan Burns, furnishes an instance of the venous variety of nævus, affecting both the skin and the sub-cutaneous tissues: —

Case 140. — A middle-aged stout man presented a large, livid, compressible tumour, in the vicinity of the right orbit. The swelling had existed from birth, was sometimes more distended than at others; but was seldom productive of pain, except when injured, on which occasion it poured out a considerable quantity of fluid blood. It never pulsated; but during exertion, or walking in a very hot or very cold day, it became exceedingly tense. Externally it covered about one-third of the temporal extremity of the upper eyelid, and occupied the whole extent of the lower one, the folds of which were separated to such an extent, as to produce an unseemly, irregular, and pendulous swelling, which hung down over the cheek. Towards the outer canthus of the eye, the morbid texture was interposed between the conjunctiva and sclerotica, to within the eighth of an inch from the cornea. It was chiefly in this direction that the disease was spreading. From the external angle of the eye the tumour was prolonged both outwards, and downwards. In the first direction, it extended to the point of junction of the temporal and malar bones; in the latter, it descended nearly half an inch below the line of the parotid duct. Through its whole extent, the tumour was free from pulsation; no large artery could be traced into it; by pressure it was readily emptied of its contents; but, on the removal of the pressure, it was again slowly filled. When emptied, by rubbing the collapsed sac between the fingers, a doughy impression was communicated to them. On the surface it was of a dark purple colour, with a tint of blue on those parts covered by the skin; but where invested by the conjunctiva, it had a shade of red. It was cold and flabby, communicating to the fingers the same sensation which is received on grasping the wattles of a turkey-cock.

As the tumour was increasing and threatened to extend over the eye, the patient was anxious for its removal. Mr. Burns began the operation by detaching the lower eyelid along its whole extent, he then dissected away that part of the tumour adhering to the sclerotica, and next removed that which adhered to the upper eyelid. This being done, he tied a pretty large artery which passed into the tumour from the outer and lower part of the orbit, by the temporal side of the inferior oblique muscle. The next stage of the operation consisted in dissecting off the tumour from the aponeurosis of the temporal muscle, the zygomatic process, the malar bone, and from over the branches of the portio dura, and the parotid duct. After the great body of the tumour was in this way removed, Mr. Burns found that a part of the spongy morbid mass still remained attached to the parts behind the parotid duct and portio dura. He also discovered that some of the tumour dipt beneath the fascia of the temporal muscle, which was reticulated. From these parts there was a general oozing of blood; and from the divided transverse facial artery, as well as from the arteries which perforated the malar bone and the masseter muscle, there was a pretty profuse bleeding. The vessels were secured, and then, with the forceps and scissors, Mr. Burns cleared away the diseased matter from behind the parotid duct and portio dura, both of which were thus detached from all connection with the neighbouring parts. In the same way, he was obliged to cut away a quantity of diseased substance from behind the zygoma. As the morbid parts were here ill defined, and much intermixed with the fibres of the temporal muscle, a considerable part of it required to be taken away, and in doing this, the deep-seated anterior temporal artery was divided. What of the tumour remained on the cheek, adhered so firmly to the zygomatic muscle, and was so closely incorporated with its substance, that the one could not be separated from the other. The insulated part of the portio dura and the parotid duct were now laid back on the masseter muscle, and the edges of the integuments brought into contact over them, and supported by means of a single suture. Over the malar bone the lips of the wound could not be made to approach, nor did the oozing from the bone cease. A fold of linen and a layer of sponge were therefore laid into this part of the wound, and retained there by a compress and bandage, applied so tightly as to restrain the bleeding.

The sponge was removed two days afterwards, and an attempt made to bring the lips of the wound nearer to each other. The sore began to granulate, and threw out a flabby red fungus, the growth of which could not be checked by the application of sulphate of copper. By bringing the edges of the sore together, it was at length reduced to the size of a shilling, and was soon afterwards completely cicatrized.

Three years after the operation, the patient continued free from any return of the disease, and the cicatrice was becoming smaller. The only inconvenience which he experienced, arose from the motion of the upper lid being impaired, by its adhesion to that part of the sclerotica from which the tumour had been dissected. From the same cause, the eye did not possess the same latitude of motion as formerly. It required a considerable effort to turn the pupil towards the nose.[31]

It will be evident upon the slightest consideration, how very different in activity, if not in nature, this case of Mr. Burns is from that of Mr. Bell; and how much less the danger attending the extirpation of such a passive or venous aneurism by anastomosis, compared to that which is inseparable from every attempt to touch with the knife, the active or arterial tumour of the same sort.

13. *Obliteration of the carotid artery.* The bold and successful practice of Mr. Travers, who, for an aneurism by anastomosis within the orbit, tied the common carotid artery, has been followed by Mr. Wardrop in several cases of this disease situated externally. In these cases, Mr. Wardrop went upon the probability, that if the current through a nævus were arrested by tying the arterial trunk supplying it, the blood contained in the cells or parenchyma of the tumour, would undergo a process of coagulation, as the blood does in a common aneurismal sac after the artery has been tied, that the coagulated blood would be afterwards absorbed, and the tumour gradually shrink. Mr. Wardrop has published the particulars of three cases of nævus of the

face, in which he tied the common carotid. All the three patients were young children. Two of them died, the circumstances preceding the operation being very unfavourable.

Case 141.—A female child, five months old, had a large sub-cutaneous nævus on the left side of the face, covering one half of the root of the nose, the eyebrow, and the upper eyelid. The eyelid could not be sufficiently raised to expose the eyeball, nor could the precise limits of the disease be traced in the orbit, within which it seemed to penetrate deeply. The tumour was of a pale blue colour, and there were numerous tortuous veins in the integuments covering it. It had no pulsation, felt doughy and inelastic, and when squeezed became greatly diminished; on removal of the pressure, its original size was rapidly restored.

As it would have been extremely dangerous, and probably even impracticable, to remove the tumour with the knife, and as it had been rapidly increasing since a few days after the birth of the child, Mr. Wardrop concluded that the only chance of arresting the progress of the disease, was by tying the common carotid of that side on which the tumour was situated. The incision of the integuments was made about the middle of the neck, along the tracheal edge of the mastoid muscle, and the rest of the dissection was accomplished chiefly with a sharp-pointed double-edged silver knife. The operation was more difficult than might have been expected in a simple dissection amongst healthy parts, from the unceasing crying of the infant, which kept the larynx and trachea in constant motion upwards and downwards. This not only prevented the pulsation of the carotid from being distinguished, but when the sheath of the vessel was distinctly penetrated by the point of the knife, rendered it difficult to get the point of Bremner's aneurismal needle conducted by the finger, fairly within the sheath. When, however, the latter step of the operation was accomplished, the needle passed around the artery with great facility. Some divided vessels bled a good deal during the operation, so that the wound was kept filled with blood, and the dissection was necessarily conducted with the finger as the only guide. The ligature being tied, the edges of the wound were brought together by a single stitch, and no adhesive plaister or bandage employed.

The infant appeared pale and much exhausted after the operation, and had a tea-spoonful of the syrup of white poppies. A remarkable change was immediately observed in the tumour. No sooner had the carotid been tied, than the child was observed to raise the upper eyelid sufficiently to expose the eyeball, which, until that period, had never been in view, on account of the swollen state of the lid. The colour of the tumour also changed, losing its scarlet hue, and appearing of a much darker blue shade; a change, observes Mr. Wardrop, which evidently had arisen from the collapse of the arteries, whilst the veins and cells of the tumour remained filled with venous blood. Soon after the operation, the child became tranquil, and in a few hours was permitted to suck, care having been taken to keep the mother's mind easy by her absence during the operation, and by concealing from her the extent of the wound. The child passed a very quiet night, the operation seeming to produce very slight excitement in the general system. She continued to suck as if nothing had happened, and the wound inflamed so little as to require no dressing. The ligature came away upon the eleventh day. On the day following the operation, the tumour continued of the same diminished bulk, and of the same dark purple colour, which it had assumed immediately after the artery was tied. On feeling the tumour, it seemed either as if the blood which it contained, had coagulated, or that it was emptied of its blood; for pressure, instead of emptying its contents, now produced no sensible alteration. A gradual, though not always regularly progressive diminution followed; by degrees, more and more of the eyeball became exposed; and ten months after the operation, nothing of the tumour remained, more than the membranous bag originally distended with blood.[32]

Case 142.—A fat comely girl, 18 years old, was admitted as a patient into the Massachusetts General Hospital, 4th May, 1829. Little more than a year before that time, she began to experience a strange feeling in the inner angle of the right eye, at the anastomosis of the facial, ophthalmic, and frontal arteries. This sensation she described as a *crowding feeling* in the eye. It soon extended to the head, and was accompanied with a pain so severe, that though otherwise in perfect health, she was obliged to give up her work as a house-servant, and had remained idle for some months before entering the hospital.

At this time, there was a tumour at the inner angle of the eye, just above the lacrymal sac, as large as a hazel nut. It had an active pulsation, which extended into the neighbouring arteries. The pulsations of the facial were very strong; and by compressing that artery, the vibrations of the tumour were much lessened. Compression of the temporal artery produced no change. The skin over the tumour was slightly reddened, and there was an increase of heat. The carotid artery had an augmented pulsation. Pressure on this artery suspended the pulse of the tumour. The stethoscope, applied over the carotid and facial arteries, gave the saw-mill sound.

After observing the case for a few days, Dr. Warren performed the following operation: —He made a small incision, between the tumour and the cavity of the orbit. The pulsation of the anastomising branch of the ophthalmic was discovered, and a ligature passed round this branch. Next, an incision was made across the facial artery, below the tumour; and after allowing about 18 ounces of blood to flow, a compress was applied, including the artery and the tumour. On the division of the facial, the pulsation ceased, and the patient was relieved from her distressing feelings. On removing the compress, three days after, a slight pulsation was perceived. The wounds healed immediately; and the patient finding herself very comfortable, was discharged on the first June, although the pulsation had not wholly ceased.

Dr. Warren was disposed to believe, that the cutting off the supply from the ophthalmic and facial arteries would be followed by the disappearance of the tumour. His expectations were disappointed. In the latter part of October, the patient returned to the hospital. A very slight pulsation was discernible in the tumour, and the inner angle of the left eye had a pulsation somewhat stronger than that on the right side. The arteries leading into it, had strong pulsations. The carotid on each side, especially on the right, throbbed violently; so that she sometimes said she felt as if the top of her head were flying off. The upper part of the face and the forehead were red and swollen; and, on the whole, there was a great aggravation of the disease.

Dr. Warren was at a loss how to proceed, as the disease now appeared equally on the left and on the right side, and extended apparently to the whole arterial system of each. He began by trying the effect of general remedies. The patient was ordered to be kept perfectly quiet; to live as low as possible; to have blood taken from the arm, and leeches applied frequently to the head; and to take the tincture of digitalis. These measures were followed by no favourable effect. Dr. W. therefore laid bare and penetrated the temporal artery of the right side, allowed it to bleed freely, and then divided it; but the pulsations remained unmitigated. There seemed but one course left, that of tying both carotids, or rather, of tying one, and, if this did not answer, the other.

On the 2nd January, 1830, Dr. W. tied the right carotid. The pulsations on the right side were immediately relieved. Those on the left continued for a time, then slowly subsided, and on the 3rd March, the patient was discharged perfectly well. Dr. W. thinks that the complete success, from tying the right carotid, showed that the affection of the left side was altogether sympathetic.[33]

As the interruption of the current through the facial and ophthalmic arteries was not successful in checking the disease in the case just quoted, while it was ultimately cured by tying the carotid, it might perhaps seem advisable in similar cases to begin by securing the carotid, and not the immediate arteries of the tumour. Dr. Warren states, however, that, this is not the inference he should draw. He would not recommend the ligature of the carotid in such a case, in the first instance; because he should expect that vessels so small as those passing into the tumour, and communicating so freely with those of the other side, would be immediately supplied with blood from anastomosing arteries, to a sufficient degree to keep up the circulation, and maintain the morbid action in the tumour. He feels satisfied that tying the carotid at first, would not have accomplished the cure in the above instance. The facial, temporal, and ophthalmic arteries had been previously divided, and the disease had felt the impression of this measure; the suspension of the current from the carotid, coming in aid of the means already employed, was sufficient to effect a cure. In support of these views, Dr. W. refers to the case of a woman, who having fallen down stairs, and struck the inner angle of the right eye, a pulsating tumour arose there, which affected the vision of the eye. It extended into the orbit, so that he could not reach the ophthalmic branch within the tumour. He therefore tied the carotid, but without any alleviation of the disease. He would then have attempted the angular arteries; but the patient refused, and left the hospital. These views of Dr. Warren are confirmed by a case of nævus situated on the vertex, in which both carotids were tied by Dr. Mussey, with little permanent advantage, the disease afterwards requiring to be extirpated. This was done six weeks after tying the second artery, at the expense of a considerable share of hæmorrhagy; from the consequence of which, however, the patient eventually recovered.[34]

Mr. Morgan tied the carotid in a case of nævus occupying the entire side of the face, and which had previously been treated by ligature and the actual cautery. The patient recovered from the operation, but the expected benefit did not ensue.[35]

With regard to the various methods of treating nævus, it has been well observed by Mr. Philips, that each has succeeded, and all have failed. It may also be observed, that it is often the case that a cure, partially effected by one method, requires to be completed by another. One method having proved a total failure, a cure is sometimes readily effected by a different method. The danger of exciting erysipelas and phlebitis by some of the methods, must not be overlooked, fatal results having followed from these accidents. Hæmorrhage also must be guarded against, as exceedingly likely to follow some of the plans of cure above described.

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[1] The disease here under consideration affects the small vessels, but there is an analogous state of the arterial trunks, sometimes called *aneurisma racemosum.* See Maclachlan, Glasgow Medical Journal; Vol. i. p. 81; Glasgow, 1828: Syme, Edinburgh Medical and Surgical Journal; Vol. xxxi. p. 66; Edinburgh, 1829. There is also a *varix racemosus*, for cases of which see Warren's Surgical Observations on Tumours, p. 427; Boston, 1837.

[2] On the structure of nævus, consult Müller on the Nature of Cancer, translated by West; Pl. V. and VI. figs. 16, 17; London, 1840: Paget, Lectures on Tumours; London Medical Gazette; Vol. xlviii. Lect. 8: Birkett, Medico-Chirurgical Transactions; Vol. xxx. p. 193; London, 1847: Coote, Medical Gazette; Vol. xlv. p. 412; London, 1850.

[3] Bell's Principles of Surgery; Vol. i. p. 456; Edinburgh, 1801: Bateman's Synopsis of Cutaneous Diseases, p. 239; London, 1819: Fawdington, North of England Medical and Surgical Journal; Vol i. p. 56; Manchester, 1830: Philips, Medical Gazette; Vol. xii. p. 7; London, 1833.

[4] Annales d'Oculistique, 1er. Vol. Supplém. p. 26; Bruxelles, 1842.

[5] See Brainard's cases, cured by collodion, Monthly Journal of Medical Science; Vol. x. p. 72; Edinburgh, 1850.

[6] Traité des Maladies Chirurgicales; Tome ii. p. 269; Paris, 1814.

[7] Surgical Observations on Injuries of the Head, and on Miscellaneous Subjects, p. 228; London, 1810.

[8] Dieffenbach, Operative Chirurgie; Vol. i. p. 236; Leipzig, 1845.

[9] Medico-Chirurgical Review; Vol. vii. p. 280; London, 1827: Lancet; Vol. xii. p. 750; London, 1827: Glasgow Medical Journal; Vol. i. p. 93; Glasgow, 1828. See Case of large sub-cutaneous Nævus, cured by Vaccination, by Woolcott, Lancet, March 13, 1852, p. 261.

[10] Medical Gazette; Vol. xxxv. p. 786; London, 1845.

[11] Zeitschrift für die Ophthalmologie; Vol. i. p. 485; Dresden, 1831.

[12] Lancet; Vol. xi. p. 652; London, 1827.

[13] Liston's Practical Surgery, p. 333; London, 1846.

[14] London Medical Gazette; Vol. xix. p. 13; London, 1836.

[15] Ibid. Vol. xxi. p. 529; London, 1837.

[16] Warren, Op. cit. p. 418 : Lallemand, Archives Générales de Médecine, 4e. Série, Tome i. p. 416; Paris, 1843.

[17] See Case by Bernard, Medical Times and Gazette, March 27, 1852, p. 318.

[18] Medical Gazette; Vol. vii. p. 677; London, 1831 : Lancet, Nov. 1837, p. 353.

[19] Medical Gazette; Vol. xxvii. p. 605; London, 1841.

[20] System of Practical Surgery; Part i. p. 118; Edinburgh, 1838.

[21] Fawdington, Op. cit. p. 66; Macilwain, Medico-Chirurgical Transactions; Vol. xviii. p. 189; London, 1833: Bellingham, Dublin Medical Press, August 16, 1848, p. 97.

[22] Medical Gazette; Vol. xli. p. 581; London, 1848.

[23] Ib. Vol. xlv. p. 138; London, 1850.

[24] Op. cit. p. 335.

[25] Archives Générales de Médecine; 2e Série, Tome viii. p. 5; Paris, 1835; 4e Série; Tome i. p. 459; Paris, 1843.

[26] Medical Times and Gazette; July 3, 1852, p. 22, and December 11, 1852, p. 594.

[27] On the sub-cutaneous ligature, the suggestion of which is ascribed to M. Ricord, see Curling, Op. cit. : Birkett, Guy's Hospital Reports, Second Series; Vol. vii. p. 294; London, 1851 : Broadhurst, Medical Times and Gazette, May 8. 1852, p. 474.

[28] Petit, Traité des Maladies Chirurgicales; Tome i. p. 266; Paris, 1790.

[29] Op. cit.; Vol. i. p. 241.

[30] Bell, Op. cit.; Vol. i. p. 461.

[31] Observations on the Surgical Anatomy of the Head and Neck, p. 331; Glasgow, 1824.

[32] Lancet; Vol. xii. p. 267; London, 1827. Mr. Wardrop's unsuccessful cases are contained in the Medico-Chirurgical Transactions, Vol. ix.; and in the volume of the Lancet now quoted.

[33] Op. cit. p. 400.

[34] Medical Gazette; Vol. vi. p. 76; London, 1830.

[35] France's Edition of Morgan's Lectures on the Diseases of the Eye, p. xiv.; London, 1848.

SECTION XXV. — ŒDEMA OF THE EYELIDS.

The looseness of the cellular membrane of the eyelids, and the absence of adipose tissue, permit them readily, and to a great extent, to become œdematous. This affection may depend either on local or on general causes.

There is generally some œdema attending the acute stages of the ophthalmiæ. We see the lids become œdematous from wounds and bruises; from erysipelas; from diseases of the orbit, as necrosis; or diseases within that cavity, as orbital tumours; from diseases of the nasal sinuses, as polypus; from the irritation of abscesses of the face or scalp; from the application of pressure to the lower parts of the face, as after the operation for harelip; and even from the pressure of crutches. When disease of the orbit, or within it, or disease of the nostril, is the cause, the œdema often affects the opposite lids, as well as those of the same side; and the like is observed when abscesses about the head are the cause. After scarlatinous ophthalmia, and after the too frequent use of emollient fomentations and poultices, during inflammatory affections of the eyes, particularly where the poultices are allowed to become cold, and to lie long without being changed or removed, we not unfrequently find the lids puffy and œdematous.

In other cases, œdema of the lids is part of a general dropsy, as in the anasarca consequent to scarlet fever; or it exists without any other part of the body being dropsical, in adults of leucophlegmatic constitution, or in scrofulous children. In some cases it appears to be a sympathetic affection, connected with disease in some remote organ. Dr. Parry observed it in several instances, in connection with violent pain of head, depending probably on costiveness.[1] Albuminuria may be suspected, and the urine should be examined, when the lids long remain puffy. It rarely happens that this affection occurs spontaneously, or without some evident cause, in an individual otherwise perfectly healthy.

The eyelids affected with œdema are swollen, smooth, sometimes pale, sometimes red, semi-transparent, and soft; yielding easily to the pressure of the finger, and in some cases retaining the mark of pressure for a time. Their motions are impeded, and the eyes cannot be completely opened.

Œdema of the eyelids succeeding to a wound or bruise, to an attack of erysipelas, or to the pressure of a bandage on the lower parts of the face, is gradually and completely removed, when the cause which had produced it ceases to operate. That which appears in the morning in persons of a leucophlegmatic habit, diminishes during the course of the day, and is not dangerous. That which arises in scrofulous children, or in adults without any evident cause, continues long, or comes and goes at uncertain intervals of time.

Blood-letting and diuretics, in scarlatinous dropsy, and in the inflammatory variety of Bright's disease, prove effectual in removing the attending œdema of the lids, in proportion as the urine becomes natural and copious. In albuminuria depending on fatty degeneration of the kidney, a mild diet, without alcohol, ought to be prescribed, and purging or mercury should be avoided.

In other cases, gentle stimulants externally, and tonics internally, may be used with advantage. Bathing the lids with rose-water, or with lime-water sharpened with a little brandy, will be found useful. Bags of dried aromatic herbs, as chamomile flowers, sage, or rosemary, with a little powdered camphor, suspended from the brow, so as to cover the lids, are highly recommended. The bags should be made of old linen, quilted, so as to keep the herbs equally spread out. When the œdema is periodic, and without any evident cause, a blister to the nape of the neck will be found advantageous. In scrofulous and debilitated subjects, chalybeates, and the preparations of cinchona, are indicated.

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[1] Collections from the unpublished Medical Writings of C. H. Parry, M. D.; Vol. i. p. 581; London, 1825.

SECTION XXVI. — EMPHYSEMA OF THE EYELIDS.

A swelling of the eyelids, produced by the presence of air in their cellular membrane, may either be part of a general emphysema, arising from an injury of the organs of respiration, in which case the air, escaping from the lungs, spreads through the whole body, and accumulates chiefly where the cellular substance is loose; or it may be the consequence of such an injury or diseased state of the nasal parietes, as shall permit the air to pass from the cavity of the nose directly into the cellular membrane of the eyelids.

The following cases illustrate the second variety of emphysema of the eyelids.[1]

Case 143.—A young man received a violent blow on the nose in consequence of which he experienced rather severe pain. Some hours after, while forcibly blowing his nose, he felt a peculiar sensation ascending along the side of it, to the internal angle of the left eye, and spreading to the two eyelids. These immediately became so much swollen, that the eye was entirely covered. When the patient was received at the Hôtel-Dieu, the lids were very tense and shining, but indolent and without any change of colour in the skin. An emphysematous crepitation was distinctly perceived.

He was bled from the arm, and compresses, dipped in a discutient lotion, were applied over the swelling. In four or five days, the cure was complete. M. Dupuytren supposed that the blow received by the patient had occasioned laceration of the pituitary membrane, opposite the union of the lateral cartilage of the nose, which had been detached from the lower edge of the nasal bone.[2]

Case 144.—A lad of 16 years of age, as he was going along the street, with a load, ran inadvertently against a person passing in the opposite direction; a scuffle ensued, in which he received a severe blow immediately over the right frontal sinus. About an hour after, having occasion to blow his nose, the eyelids and parts adjacent became immediately inflated, so as completely to close the eye, and he felt the air rush, he said, into those parts. On being admitted into Guy's Hospital, under the care of Mr. Morgan, the eyelids were much distended, and so closely approximated, that they could not be separated by any voluntary effort of the patient; the eyebrow was also puffed up, and the cellular membrane between the ear and the orbit was in the same state of emphysema. The parts were not at all painful on pressure; they yielded a crackling sensation to the touch, and were free from discolouration. The supposed seat of the fracture was at a small distance above the superciliary ridge, where a slight depression, but no crepitus, could be felt. The globe of the eye was perfectly natural.

Two small incisions were made through the integuments, about the eighth of an inch behind the external angle of the frontal bone, which allowed the air to escape. The swelling subsided in twenty-four hours, leaving the eye and surrounding soft parts in a perfectly healthy condition.[3]

Case 145.—A robust man, 46 years of age, was brought senseless into the Hôtel-Dieu, and placed in one of the surgical wards; but as there was profound stupor, with stertor and complete relaxation of all the limbs, without any external lesion, he was removed into one of the medical wards. On examining him with care, the jaws were found strongly convulsed, and the muscles of the neck stiff. When the nose was pinched, so as to interrupt the passage of the air, respiration was suspended during at least half a minute, when a violent expiration being made, the left upper eyelid was perceived to swell a little, and the experiment being repeated, the same effect was again produced, and the eyelid assumed a considerable size, with emphysematous crepitation. On examining the eyelid, there appeared a slight abrasion, and yellowish tint of the skin, from which it seemed probable there was a fracture of the roof of the orbit, or of the base of the cranium, permitting the air from the ethmoid or sphenoid sinuses, to pass into the substance of the eyelid, when an obstacle was presented to its exit by the nose. Information was obtained, that he had been assaulted, about twelve days before, by several men, who hit him on the face with an umbrella and left him lying senseless on the street. He died the second day after his admission.

On dissection, a fracture of the roof of the orbit, with laceration of the anterior lobe of the brain, extending to the depth of eight lines, was discovered. The dura mater was separated from the bone to a great extent around the fracture, but was not torn. One of the osseous fragments extended to the great notch of the frontal bone, and communicated with the middle ethmoid cells, which contained a small quantity of liquid blood.[4]

I have seen several cases of emphysema of the lids from blows. In some crepitation was distinct, in others not. In one case, the upper lid hung over the eye, as if palsied. In another, the eyeball was considerably forced forwards by the presence of air in the areolar tissue of the orbit.

This affection may arise altogether independently of a blow.

Case 146.—A scrofulous girl, blowing her nose violently, felt her right eyelids drawn together. Next day, I found the lids puffy, but without any crackling. She had no perceptible disease in her nose, but had suffered much from scrofulous ophthalmia. On the second day after the accident, the swelling was less, but the emphysematous crackling, when I pressed the lids, distinct.

Case 147.—A man whose right nostril was nearly closed by a twist of the septum, tried to clear it by blowing. Suddenly the right lids swelled with air, and the eyeball became somewhat protruded.

The application of cold water, and a dose of laxative medicine, formed the whole treatment in these two cases, both of which probably depended on a rupture of some part of the Schneiderian membrane.

The plan of incision through the integuments, followed in Case 142, is also adopted when the eyelids are greatly distended, in cases of universal emphysema. It is merely, of course, a palliative remedy; the complete removal of the disease depending on the healing up of the injured part of the lungs, or windpipe. Even in cases of rupture of some portion of the nasal parietes, the evacuation of the diffused air is merely palliative, and scarcely worth the while to practise. Till consolidation is effected, the emphysema will be liable to return when the patient blows his nose, against which he is therefore to be put on his guard.

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[1] A case of emphysema of the eyelid, from a gunshot wound of the frontal sinus, is related by Baudens, in his Clinique des Plaies d'Armes à Feu, p. 162; Paris, 1836.

[2] Leçons Orales de Clinique Chirurgicale, par Dupuytren; Tome i. p. 128; Paris, 1832.

[3] Lancet; Vol. x. p. 31; London, 1826.

[4] Menière, Archives Générales de Médecine; Tome xix. p. 344; Paris, 1849.

SECTION XXVII. — TWITCHING, OR QUIVERING OF THE EYELIDS.

Syn.—Κυνικὸς σπασμὸς, *Aretæus.* Tic non-douloureux, *Fr.* Spasmodic or muscular tic. Life-blood, *Vulg.*

I have often been consulted by patients who complained of a tremulous, quivering, or twitching motion of one or other eyelid, or of both, which they were unable to control or to prevent, and which, from the frequency of its repetition, had become very annoying, although not attended with pain. In many cases, the quivering of the ciliaris is so slight as not to produce any visible motion of the affected lid; the patient merely feels the part moving; but in other cases, the motion is very evident, and is not confined to the orbicularis palpebrarum, but extends to other muscles of the face, and especially to the zygomatici, so that while the eyelids are convulsed, the angle of the mouth is drawn upwards. In some cases, as in those related by M. Francois[1], the whole of the muscles of the face animated by the portio dura, are convulsed. In one instance, even the muscles of the velum, the stylo-hyoid, and the posterior belly of the digastric, seem to have been affected.[2] In some cases, I have seen the spasm spread to the neck and to the arm, so that these parts were strangely agitated along with one side of the face, whenever the patient began to speak. Morbid nictitation, and blepharospasm, to be considered in the following Sections, are akin to twitching of the lids; as is also that spasmodic affection of the frontalis, in which the eyebrows are every other minute drawn violently upwards. These are in general reflex diseases of the portio dura; they are spasms, clonic or tonic, of muscles under its control.

Agitation of mind generally aggravates twitching of the lids, so that in speaking to a stranger, it becomes much increased. The patient is conscious of this; his feelings are hurt by the knowledge of his being subject to the complaint, and he often becomes anxious to undergo any sort of treatment likely to relieve him, not even excepting an operation. Although, in by far the greater number of cases, no pain attends the disease, it is occasionally accompanied by pain so severe as to resemble tic douloureux.

Causes. I have generally found the patient's digestive organs deranged, and most frequently, from the use of alcoholic fluids. In one case which I saw, the disease was brought on in a female servant, from her sitting up in the night, and over-fatiguing her eyes in stitching fine linen.

The discovery of Sir C. Bell, that the fifth nerve is the nerve of sensibility, and the portio dura of the seventh the nerve of motion of the face, leads us to refer the cause of such abnormal motions to a disordered influence of the portio dura. In certain cases, the disease may perhaps depend on some limited affection of one or other of the fasciculi of the facial nerve, altogether exterior to the cranium; but, in general, the nerve seems to be excited to irregular action in consequence of some remote disorder, sufficient to disturb the natural control of the brain over the motions of the face. The original irritation seems to be most frequently propagated from the stomach to the nervous centre, probably by the nervus vagus, whence it is reflected to one or more twigs of the facial, and shows itself in clonic spasms of the lids and face.

The state of spasm or convulsion on one side of the face, sometimes produces an appearance as if the other side were affected with palsy. "A lady complained of pain in the head," says Sir B. C. Brodie, "and her mouth was drawn to one side; and hence she was supposed to suffer from paralysis of the muscles of one side of her face. However, when I was consulted respecting her, I observed that there were nearly constant twitches of the cheek and eyelids on that side to which the mouth was drawn; and on more minute examination, I was satisfied that the distortion of the mouth arose, not from the muscles on one side of the face being paralytic, but from those on the opposite side being in a state of spasm. The case precisely resembled that of a patient with spasmodic wry-neck, except that the disease influenced a different set of muscles, namely, those supplied by the facial nerve."[3]

Prognosis. When the affection is recent, and limited to the lids, and the patient has resolution enough to submit to a proper regimen, the prognosis is not unfavourable. Otherwise, the disease persists for life.

Treatment. 1. The patient must give up entirely the use of wine, ale, spirits, and the like.

2. Essential benefit results from the use of laxative, alterative, and tonic medicines. A blue pill every night, or every second night, and one or two compound rhubarb pills every morning, for a fortnight, will generally be attended with good effects; after which, a course of bitter infusion, precipitated carbonate of iron, or some of the preparations of cinchona, ought to be prescribed, along with country air and exercise.

3. Anodyne liniments, rubbed in along the course of the portio dura, have been recommended.

4. Continued pressure, so as to limit the motion of the parts spasmodically affected, has been found advantageous, tending to break the habit on which, in a great measure, the complaint depends, by what means soever it may have been originally produced.

5. The abstraction of blood from behind the ear, by cupping or by leeches, is advisable. The lower lid being affected, I have known much relief obtained from a leech at the inner angle of the eye. Turberville had a patient long troubled with pain and convulsions in his cheek; the place where the pain was, could be covered with a penny; the convulsions pulled his mouth, face, and eye aside. Turberville applied a cupping-glass to the place, then scarified, and cupped again; after which he put on a plaister, and the patient was perfectly cured.[4]

6. An issue between the angle of the jaw and the mastoid process has proved decidedly useful.

7. Division of the nervous filaments of the facial nerve would remove the disease, but would substitute a paralysis. In order to avoid this evil, and yet attain the same object, Dieffenbach, in one case, performed a sub-cutaneous division of the offending muscular fibres.[5] This is done by introducing a narrow knife under the skin, turning its edge towards the muscle, and dividing it as the knife is withdrawn.

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[1] Edinburgh Medical and Surgical Journal; Vol. lxxv. pp. 86. 381; Edinburgh, 1851.

[2] Ibid. p. 104.

[3] Medical Gazette; Vol. v. p. 559; London, 1830.

[4] Philosophical Transactions; No. 164; Lowthorp's Abridgement, Vol. iii. part i. p. 34; London, 1716.

[5] Romberg's Manual of the Nervous Diseases of Man, translated by Sieveking; Vol. i. p. 297; London, 1853.

SECTION XXVIII. — MORBID NICTITATION.

While natural nictitation is accomplished so instantaneously and easily as scarcely to attract the notice of ourselves or others, there is a morbid nictitation, which appears to be not so much the effect of relaxation of the levator palpebræ superioris, as a convulsive action of the orbicularis palpebrarum, too remarkable not to be observed by others, and of which, at last, the patient himself becomes painfully conscious. In the cases referred to, the shutting of the eye, instead of being performed only once, is repeated several times in immediate succession. In some instances, the upper eyelid is principally affected;

in others, the lower. Sometimes one eye only; generally, both eyes are affected. Analogous to the subject of last section, although readily distinguishable from it, the present disease is aggravated by the same causes, especially agitation of mind, and disordered digestion.

Sometimes a single eyelash, growing inwards so as to touch the eyeball, is the cause of morbid nictitation. In other instances, slight conjunctival ophthalmia produces it. These causes being removed, the complaint will cease. In many instances, morbid nictitation seems merely a bad habit, or what the French term a *tic*. We often see it in children, whose eyes are overworked. Sometimes it is a sign of indigestion. In such cases, a treatment similar to what has been recommended for quivering of the eyelids, should be adopted. Advantage is obtained from wearing a green bonnet-shade, and using a collyrium, containing from 1 to 2 drachms of the tincture of belladonna, in 8 ounces of water. From 6 to 12 grains of rhubarb powder, with from the twelfth to the sixth of a grain of tartar emetic, each night, prove serviceable.

SECTION XXIX.—BLEPHAROSPASM.

The reflex action by which the eyelids are closed, often assumes the form of tonic spasm, and is then termed blepharospasm. It is generally, but not always, accompanied by intolerance of light, or photophobia, and often by epiphora. It generally affects both eyes pretty equally; sometimes, only one. The stimulus on which the spasmodic contraction of the orbicularis palpebrarum depends, is of course communicated through the facial nerve. The exciting cause of the irritation resides sometimes in the organ of vision; sometimes, in remote organs. In different cases, it operates on the nervous centre whence the facial nerve arises, through the fifth nerve, through the optic nerve, through the nervus vagus, or through the great sympathetic; or is derived immediately from some cerebral disturbance.

1. A particle of dust adhering to the inner surface of the upper eyelid, an inverted eyelash, or some minute deposition in the site of the Meibomian follicles, is a common cause of blepharospasm; the irritation being communicated to the nervous centre through the fifth nerve. The photophobia and spasm of the eyelids generally subside very soon after the cause of irritation is removed.

2. In scrofulous conjunctivitis, the spasm is often continued, with slight evening remissions, for months together. The patient, generally a child, is all that time unable to bear the least accession of light, or to open the eyes in the smallest degree, during the day. The inflammation during this state may be very inconsiderable, so that on forcing open the lids, scarcely a red vessel is discovered. Such, however, is the sympathy between the conjunctiva, which is the primary seat of irritation, and the neighbouring parts, the retina, cerebral optic apparatus, lacrymal gland, and orbicularis palpebrarum, that the admitted light seems to the patient to blaze like the rays of the sun reflected

from a mirror; the lacrymal gland instantly pours out a tide of tears, and the spasm of the orbicularis forces the lids together with new violence. The removal of the ophthalmia, by the treatment hereafter to be explained, is the only means of obviating these, its reflex effects.

3. In some cases of severe blepharospasm and intolerance of light, the symptoms have been completely relieved only by the extraction of carious teeth, or teeth at the roots of which abscesses existed. Several remarkable instances of this sort are recorded by Dr. Hays of Philadelphia[1], showing the propriety of examining with care if such cause of irritation may not be in existence.

4. In a fourth set of cases, the original irritation appears to be in the retina, the disease being the result of over-use of the eyes.

Case 148. — Sir C. Bell has recorded[2] a case of photophobia and blepharospasm, brought on by over-exertion of the eyes upon minute objects, in which the attacks came on periodically, the patient losing all control over the muscles of the eyelids and eyeballs. The complaint was attended with occasional pain extending round the head, as if it were bound with a hoop, and a whizzing noise in the ears. Suddenly the spasm would go off, the eyes becoming open, and capable of being fixed on the surrounding objects, for perhaps the space of an hour. Excitement of the mind in conversation would produce this temporary improvement; and what was very remarkable, the patient, an intelligent young lady, discovered that on pressing with the point of her finger on the little pit before her ear and above the jugum, the eyes instantly opened, and remained so long as the pressure was continued. Sir C. found, that when he put the point of his thumb under the angle of the jaw, and pressed the carotid against the vertebræ, the same effect was produced, proving, he thinks, that the cessation of the spasm was caused by some influence of the circulation over the nervous system of the head. On pressing down the cartilages over the left hypochondriac region, so as to affect the cardiac portion of the stomach, the eyes opened and remained open while the pressure continued.

In cases of this kind, the intolerance of light is often excessive; we find the patient in a room totally dark, with his eyes tied up; he cannot allow them to be examined; and compares the sensation he experiences from attempting to open his eyes, to what might be felt on looking at a sea of molten gold. In one young gentleman in this state, by whom I was consulted, the attempt to open his eyes often seemed ready to throw him into a state of general convulsion. He was cured completely by leeches, blistering, and a long-continued course of calomel and quinine. I have seen numerous cases of this sort, which have resisted for years every kind of treatment, and have at length undergone a spontaneous cure.

5. Sometimes, spasm of the orbicularis palpebrarum of one side is brought on in consequence of a blow on the head, or other injury, the effects of which have been communicated to the brain or its membranes. The spasm continues long; for weeks perhaps, or months; and is apt to be mistaken for palsy of the levator of the upper lid. A restless state of the edge of the upper lid, and the difficulty experienced in raising it even with the finger, will serve to distinguish this state from palsy.

Cerebral congestion, from fever and other causes, apoplexy, and various other disorders of the brain, are productive of blepharospasm. In such cases, both sides are generally affected, the intolerance of light is excessive, exposure to strong sunlight is apt to produce violent and universal muscular spasms, and the recovery is exceedingly slow.

6. The organic nerves of the digestive system are sometimes the medium by which an irritation is transmitted to the nervous centre, whence it is reflected to the facial nerve, and the muscles, which it serves to excite, as it often is to other nerves and other organs. The cure, when this is the case, will depend on a judicious regulation of the diet, along with the administration of purgatives, alteratives, and tonics. In some cases, anthelmintics will prove serviceable, by means of their specific effect.

7. Many cases of blepharospasm are of hysteric origin. They are often mistaken for palsy of the levator palpebræ superioris, and erroneously designated by the name of hysteric ptosis.

Case 149.—Dr. Schön relates[3] the case of a scrofulous girl, of 15 years of age, who laboured under blepharospasm of the right eye for 15 months, not being once able during the whole of that time to separate the lids from one another. He employed all the remedies usually recommended, both internal and external, without the least effect. The left eye continued well, and the right never showed even a trace of inflammation. During the night of the 24th April 1831, the catamenia appeared for the first time, and the very next morning, the patient could open her eye with perfect freedom, and no longer saw double, as was previously the case when her lids were separated by another person.

In the case of a lady by whom I was consulted, the inability to open the affected eye sometimes continued constantly for two or three days, while at other times she had complete command over the eye. In another lady, not merely the sphincters of both eyes were affected, but also the muscles of the nose and lips, producing closure of the eyes, along with a peculiar and painful screwing together of the mouth. Much benefit was derived, in this last case, from the continued use of aloes and asafœtida. A combination of such remedies with tonics often proves useful in hysteric cases.

General Treatment. I have already hinted at most of the remedies to be used for the relief of blepharospasm. The cause of the original irritation must first be sought for, and against it the treatment must be directed.

In cases of an inflammatory cast, or where the disease is traced to an injury of the head, blood-letting from the arm, leeches to the temples, and a course of mercury are indicated. In gastric and hysteric cases, purgatives, antispasmodics, and tonics, such as quinine and iron, are the most available remedies. Belladonna, internally, is often of great service; as is the inhalation of ether or chloroform, every second or third day, to the extent of producing slight insensibility. Externally, counter-irritation is to be employed by means of friction with volatile liniment, tincture of cantharides, and the like, on the forehead and temple, and behind and before the ear. The application of blisters and the insertion of issues, are requisite, when milder means are ineffectual. Exposing the eyes to the vapour of opium or of belladonna, by mixing their tinctures with hot water in a teacup, to be held under the eyes, and fomenting them with poppy decoction, or a warm infusion of extract of belladonna, are useful. Poultices, containing opium, hyoscyamus, or conium, are also recommended to be applied over the eye. A small continued stream of cold water, or of water impregnated with carbonic acid gas, directed against the eye by means of a syringe or a syphon, is highly recommended by Dr.

Jüngken.[4] The vapour bath, in some cases, has proved efficacious; the cold shower-bath, in others. The patient wearing a double green shade, should gradually accustom his eyes to the light, and not indulge, as is often done, in an increasing degree of obscurity.

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[1] Medical Gazette; Vol. xxviii. p. 617; London, 1841.

[2] Nervous System of the Human Body; Appendix, p. xlvi.; London, 1830.

[3] Ammon's Zeitschrift für die Ophthalmologie; Vol. ii. p. 153; Dresden, 1832.

[4] Lehre von der Augenkrankheiten, p. 778; Berlin, 1832.

SECTION XXX.—PALSY OF THE ORBICULARIS PALPEBRARUM AND MUSCLES OF THE EYEBROW.

Syn.—Blight, *Vulg.* Palsy of the portio dura. Hemiplegia facialis.

Fig. Dalrymple, Pl. XXX.

In most cases of palsy of the face, there is a degree of lagophthalmos; or in other words, the eyelids cannot be completely closed, on account of the paralytic state of the orbicularis palpebrarum. The patient cannot wink hard, nor press the eyelids against the eyeball; neither can he, from the disease extending to the epicranius and corrugator supercilii, elevate his eyebrow, or frown, upon the palsied side. All this is most evident when the patient keeps the sound eye open, and tries to close the lids of the palsied side. He then finds that he cannot do so, at least not completely; but he closes the palsied lids much better, when he at the same time closes those of the sound side. The levator palpebræ superioris, retaining its power, raises the upper lid to the natural degree, and again, on its becoming relaxed, the lids fall to a certain extent, but the two lids cannot be brought together. They remain in some cases four-tenths of an inch apart. When the patient looks down, the levator is relaxed, and the lid falls considerably more than when he looks forwards. The tears run over on the cheek, from want of the action of the lower lid, which hangs depressed and everted; exposed to dust flying about, the patient is distressed by its getting into his eye; and thus inflammation of the conjunctiva and opacity of the cornea may be excited.[1] The loss of power, however, in the orbicularis varies in degree. It but rarely happens that it exists to such an extent as to cause any material injury to the eye, except in infants, in whom the cornea sometimes becomes wholly opaque or even destroyed by ulceration. In general, the lids merely do not close accurately, and we see the exposed eyeball turn up, when the ineffectual effort is made to bring the lids together. But in other cases, the lids gape widely, and the patient can neither raise the lower, nor bring down the upper, by any voluntary effort. If we push down the upper lid with the finger, it is thrown into loose folds, and is immediately drawn up when we cease to press upon it; if we draw down the lower lid, and then let it go, it does not spring to the eye as in health. On the patient's falling asleep, the upper lid covers the pupil, the eyeball turning up, and the levator palpebræ relaxing, but the lower lid remains depressed and everted. The retracted lids are generally puffy, and the eyeball seems protruded.

The other muscles of the face are generally paralyzed at the same time, and the natural motion of the lips is lost, so that the mouth opens most on the unaffected side, and the actions of whistling, laughing, &c. are impeded. While the sound side of the face is rotund and full, or marked by a dimple, the palsied is soft and sunk. If the disease has continued long, there is a marked diminution in the thickness of the muscles. The cheek becomes so thin that, when the patient speaks, it flaps about as if it were only skin, and the corrugator supercilii and occipito-frontalis are so wasted, that the bones seem covered only by integuments; the mouth is dragged from the palsied towards the sound side, and even the nose is twisted. Sensation over the face is natural, unless some cause be present which affects the fifth pair, as well as the portio dura of the seventh. From the exposed state of the eye, and the evaporation which goes on from its surface, the patient has a feeling of cold in it, which he remedies by covering it, perhaps, with his hand. At first he is apt to sleep with the eye uncovered, when the air drying it, will cause pain; but by and by he contrives to fall asleep with his fingers on his lids, or turns half over on his face, so that the pillow presses the lids together. Occasionally he complains of pain at the root of the ear, or in the neighbourhood of the stylo-mastoid foramen, from which the portio dura escapes, to send its branches over the face. It is stated by Landouzy, that when the cause is non-cerebral, although above the geniculate ganglion, exaltation of hearing is present.[2] Dulness of hearing is certainly not an unfrequent symptom, even in non-cerebral cases; and is probably owing, not to any affection of the portio mollis, but to derangement in the movements of the bones of the tympanum. Absolute deafness would indicate that the portio mollis was implicated. At the commencement of the disease, pain is sometimes felt, radiating along the branches of the nerve. On looking into the throat, the uvula is sometimes found to be bent into an arc, and its point turned towards the palsied side. In some cases, both sides of the face are palsied.[3] A case of this kind, which I saw, arose from a poor man being maltreated on the road, and kicked on the occiput. In such cases, the patient experiences a degree of dysphagia, speaks through his nose, and presents other symptoms indicating palsy of the velum.[4]

Causes. Palsy of the face always depends on some affection of the portio dura; but it is of great importance to distinguish those cases in which the cause exists within the cavity of the cranium, from those in which the nerve suffers in its passage through the aqueduct of Fallopius, or after it has emerged from that canal, and is spreading itself to the facial muscles. Previously to the discoveries of Sir C. Bell, palsy of the face was generally regarded as cerebral in its origin, and even when the seat of the disease was altogether exterior to the cavity of the cranium, the patient was treated with the severity which a serious disorder of the brain might properly demand. If the uvula is drawn to the unaffected side, and there are signs of a paralytic state of the velum, it is presumed that the cause is above the geniculate ganglion, which is situated on the first bend of the facial nerve, in the Fallopian aqueduct, and where the facial communicates with Meckel's ganglion by the greater superficial petrosal nerve.[5] If this deviation is absent, the cause is presumed to be below the ganglion.

Exposure to a current of cold air is the most frequent cause of palsy of the face. This cause probably operates by producing inflammation of the portio dura, and, perhaps, in some cases inflammatory swelling of the periosteum lining the aqueduct of Fallopius, and diminution of its calibre, so that the trunk of the nerve suffers pressure. According to Dr. Marshall Hall, as the inflammatory affection of the portio dura subsides, the paralytic symptoms are transmuted into a spasmodic state.[6] The disease has been known to arise from the pressure of a lymphatic gland lying between the mastoid process and the angle of the jaw, and enlarged in consequence of inflammation of the mouth from the action of mercury. Dr. Bennett relates a case[7], in which a cancroid tumour of the parotid was the cause. I have seen repeated instances in which palsy of the face attended carious abscess of the tympanum, affecting, no doubt, the aqueduct of Fallopius. In a case which came under my observation, the disease followed a severe fall on the side of the head, which produced a discharge of blood from the auditory canal, and, it is probable, an extravasation of blood within the cavities of the temporal bone. Division of the portio dura, in any accidental wound, or surgical operation, about the angle of the jaw, will produce it. Mr. Shaw mentions a case[8], in which, during the removal of a tumour from before the ear, the moment the branches of the portio dura were cut, the patient cried out, "Oh! I cannot shut my eye." One or other of the temporo-facial branches of the nerve may in this way be divided, and consequently one or other lid only may be palsied.

Experience proves that facial hemiplegia may be produced by a vivid moral affection. Andral has seen it after a violent fit of anger; Bellingeri, from a fright; Frank, from the announcement of bad news; Bottu-Desmortiers, in a young girl, from repeated crosses during profuse menstruation.[9]

Facial palsy may depend altogether on cerebral disease; on pressure of the nerve, for example, by congested vessels, or by some morbid effusion or formation within the cavity of the cranium, between the origin of the portio dura and its exit by the meatus auditorius internus. In such a case, which I have known to arise from fatigue and too much stooping, other cerebral symptoms will be present, as feelings of fulness and pain in the head, giddiness, sleepiness, &c. If other nerves are implicated, as the 6th, pressure on the pons Varolii is likely to be the cause.

Occasionally it happens that palsy of the face, depending on an affection of the aqueduct of Fallopius, is present along with serious disease within the cranium; the latter, however, in nowise operating on the portio dura. In other cases, the disease of the temporal bone, which originally produced the palsy of the face, goes on to affect the dura mater and the brain, suppuration of these parts takes place, and death speedily follows. This is especially apt to happen in scrofulous children.[10]

Treatment. In ordinary cases, the treatment must be directed against neither the brain nor the eyelids, but against the portio dura and the Fallopian aqueduct. Antiphlogistic means of cure are to be adopted in the first instance, as leeches behind the ear, and near the angle of the jaw, cupping on the back of the neck, and free purging. Calomel and opium, and the use of diaphoretics, may next be had recourse to. A continued action on the digestive system by Plummer's pill, does good. A caustic issue, or a semi-lunar blister below the ear, and stimulating liniments over the course of the nerves going to the paralyzed parts, will be found of advantage. A succession of small blisters, dusted over with strychnia, is likely to be useful. Should these means not prove effectual, a trial may be given to electricity, galvanism, or electro-magnetism. Each cheek may be touched with a plate of metal, and a shock thus passed, on which the sound lids close, but the paralytic remain unaffected. Electro-puncture appears sometimes to have been successful.[11]

When caries of the tympanum, by affecting the portio dura, produces palsy of the face, a perpetual discharge should be kept up behind the ear. The diseased ear may be cautiously injected every second or third day, with a weak solution of nitrate of silver. The membrana tympani is always partially, and often totally, destroyed in such cases; and the indiscriminate use of injections might excite inflammation, extending to the brain and its membranes. If the patient be a scrofulous child, residence at the sea-side, and a course of sulphate of quina, ought to be prescribed.

Cerebral disease, producing palsy of the face, must be combated chiefly by means of depletion, abstinence, and counter-irritation.

To prevent the bad effects of exposure of the eye to the atmosphere, and to the particles of dust collecting on the conjunctiva, the patient should be directed to foment the eye frequently with warm water, and to move the eyelid over his eye. He should keep the eyelid down during the night by means of a compress and roller.

In cases not likely otherwise to recover, the eversion of the lower lid may be remedied by tarsoraphia.[12] If the upper lid is permanently elevated, Dieffenbach divides the levator sub-cutaneously.[13]

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[1] See Shaw, Medico-Chirurgical Transactions; Vol. xii. p. 117; London, 1823.

[2] Medical Gazette; Vol. xlvi. p. 909; London, 1850.

[3] See case by Magnus, Müller's Archiv für Anatomie, 1837, p. 258.

[4] On Palsy of both facial nerves, consult Davaine, Gazette Médicale de Paris, 13 Nov. 1852, and following Numbers.

[5] Cyclopædia of Anatomy and Physiology; Vol. iv. p. 553; London, 1849.

[6] Dublin Medical Press; Vol. xxiv. p. 185; Dublin, 1850.

[7] On Cancerous and Cancroid Growths, p. 83; Edinburgh, 1849.

[8] Op. cit., p. 138.

[9] Translation of this work into French, p. viii. Paris, 1844.

[10] See case in an adult, in Pilcher's Treatise on the Structure, Economy, and Diseases of the Ear, p. 165; London, 1838. Palsy of portio dura from fatal fracture of base of skull, see Lancet, January 8, 1853, p. 24. Destruction of temporal bone, and of 7th and 8th pairs, see Medical Gazette; Vol. xlviii. p. 927; London,

1851. Palsy of right side of face, and left side of body, from disease of right side of pons Varolii, see Medical Times, Nov. 22, 1851, p. 535.

[11] See Case by Montault, Medical and Physical Journal; Vol. lxiii. p. 463; London, 1830.

[12] France, Lancet, January 5, 1850, p. 14.

[13] Die Operative Chirurgie; Vol. i. p. 743; Leipzig, 1845.

SECTION XXXI.—PTOSIS, OR FALLING DOWN OF THE UPPER EYELID.

Πτῶσις, from πίπτω, *I fall.* *Syn.* — Blepharoplegia, *a term applicable only to the 5th variety.*

Inability to raise the upper eyelid may depend on a variety of causes; as, a redundant state of the integuments, or an injury, weakness, or palsy of the levator.

§ 1. *Ptosis from Hypertrophy.*

After inflammation of the upper eyelid, attended with considerable œdematous or sanguineous effusion into its substance, or treated by the long-continued use of cataplasms, we sometimes find the lid so much thickened, and its integuments so much relaxed, that they form a fold, hanging down over the opening of the lids, while the levator palpebræ superioris is unable, from the weight and bulk of the lid, to raise it so as to uncover the eye. We perceive distinctly the endeavours of the muscle, as soon as the patient is earnestly desirous of opening his eye; but the eyelid is either raised only to a very inconsiderable degree, or remains completely depressed. If we take hold, between the finger and thumb, of a transverse fold of the skin, so as to relieve the levator muscle of the additional weight of integuments, the patient can, without difficulty, open his eye, showing that the case is not one of paralytic ptosis; but as soon as we quit our hold, the eyelid sinks to its former position. Sometimes the relaxation does not occupy so much the middle of the eyelid as its temporal portion. It is also occasionally the case, that when the fold of integuments is very considerable, it presses, by its weight, the edge of the lid, along with the cilia, inwards, so as to produce a degree of entropium.

For the cure of this variety of ptosis, the common practice is to remove a transverse fold of the integuments. In order

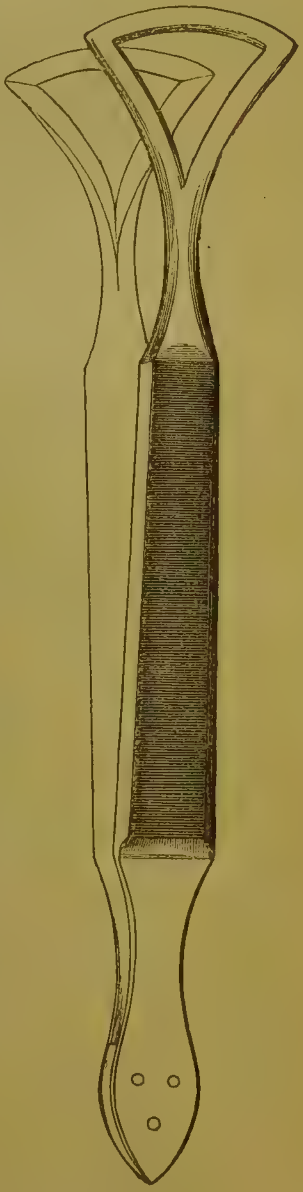

Fig. 16.

to perform this with the necessary exactness, we take hold of the skin, where it appears most relaxed, with a broad convex-edged pair of forceps, commonly called entropium forceps (*Fig.* 16.), and then desire the patient repeatedly to open and shut the eye. If he be able to do this, it is a proof that the forceps includes neither too much nor too little of the skin. If he cannot lift the lid, we have taken hold of too little, and must apply the forceps again, so as to include a greater portion of the skin. If he can, indeed, lift the lid, but not completely shut it again, we must let go a little of the skin from the grasp of the instrument. It is important also to take care that we do not apply the blade of the forceps too close to the edge of the lid; for if this be done, too little space will be left for the application of stitches. As soon, then, as the forceps is properly applied, we squeeze its blades together with moderate firmness, that the integuments may not escape, and then remove the portion laid hold of, by a stroke or two of the scissors. The bleeding is inconsiderable, and ceases in a few minutes by the use of cold water. Seldom more than two stitches are necessary; one is frequently sufficient. Union is generally effected very quickly, without any suppuration, and scarcely leaves any perceptible scar. As soon as the union is complete, the prolapsus is cured.

§ 2. *Congenital Ptosis.*

I have repeatedly met with a degree of depression of the upper lid so considerable as materially to impede the function of vision, and which had existed from birth. In some of these cases, the lid was the reverse of being swollen; it rather appeared atrophic, as if the levator muscle had either been originally deficient, or had wasted form disease. This sort of incomplete ptosis is sometimes hereditary, and is occasionally complicated with flatness of part of the superciliary arch.[1]

Removing a transverse fold of the integuments was tried in several of the cases to which I refer, but generally with little or no advantage. Perhaps better success might attend the operation recommended by Mr. Hunt, which I shall immediately have occasion to explain.

§ 3. *Traumatic Ptosis.*

In penetrating wounds of the upper lid (see p. 115), the levator may be cut or torn across, or the branch which it derives from the third nerve may be divided. The consequence will be inability to uncover the eye. In such a case, I have known the power of raising the lid to be restored, probably from the re-union of the muscular fibres which had been divided.

The snipping out of a small fold of the skin of the lid can be of no use in such cases. A close attention, however, to the structure and healthy functions of the parts concerned, has led Mr. Hunt, of Manchester, to a more rational mode of operation for traumatic ptosis. His method may also be useful when this disease arises from congenital deficiency, or from palsy of the levator.

The operation recommended by Mr. Hunt, is performed by dissecting off a fold of integument from the eyelid, and the difference between his operation and the usual way of proceeding, consists in the greater extent of the portion removed. The upper incision is made immediately below the eyebrow, and stretches, each way, to a point opposite the commissures of the eyelids. In making the lower incision, no precise direction can be given. It should approach within a short distance of the tarsal margin, and should meet the upper incision at both its extremities, so that a portion of the integuments is removed, of the shape of an olive leaf, the extent of which must vary according to the greater or less degree of the relaxation of the skin, which is the same in no two individuals. The divided edges should be accurately united by at least three stitches, and the wound dressed in the usual manner. The effect produced, when adhesion is completed, is the attachment of the eyelid to that portion of the skin of the eyebrow upon which the occipito-frontalis acts. By means of that attachment we substitute the action of this muscle, in raising the eyelid, for that of the levator.

The deformity likely to be produced by the removal of so large a portion of skin, in such a conspicuous situation, or the likelihood of substituting a lagophthalmos, or eversion, for the ptosis, may perhaps be urged as reasons against this mode of operating. The following case by Mr. Hunt, affords an answer to both these objections: —

Case 150. — In removing a large and deeply seated tumour from the left orbit of a patient of the Manchester Eye Institution, owing to the connection of the levator palpebræ with the diseased mass, the muscle was so much injured, that, after the patient had perfectly recovered in every other respect, what then appeared an incurable ptosis remained. When the lid was raised with the finger, the eye was found to possess perfect vision. Anxious to remedy the evil, Mr. Hunt, when all tumefaction of the integuments had disappeared, removed an elliptical fold of skin in the usual way. The wound healed well; but although a considerable portion had been included between the incisions, the effect upon the lid was hardly perceptible.

The poor man, after waiting for some weeks, was very solicitous to have another portion removed; and it was more in compliance with his desire than from any expectation of further benefit, that Mr. Hunt at length consented to repeat the operation. Whilst deliberating on the portion to be removed, it struck him that, if it were sufficiently near the eyebrow, the action of the occipito-frontalis, which affects this portion of the skin, might also be available for raising the eyelid, and fortunately the result fully justified the conjecture. The operation was performed as is described above, the wound united by the first intention, and the patient could raise his eyelid to the same extent as that of the other side. No deformity was produced, and the eye could be as perfectly closed as before the occurrence of the disease.[2]

§ 4. *Atonic Ptosis.*

In some instances, we meet with a depressed state of one or both upper eyelids, dependent apparently on mere weakness of the levator muscle.

In this case, mechanical support, by means of a strip of adhesive plaister, assists in restoring to the muscle its wonted power. Applications of a strengthening kind are to be made to the lids; sponging them, from time to time, with rose-water, a solution of alum, brandy, or the spirit of nitrous ether; rubbing them gently with tinctura saponis, and the like. It is in atonic cases, that such applications as that with which Wenzel cured Maria Theresa, Empress of Germany, after Van Swieten and De Haen had failed, are likely to do good. He applied pledgets over the eyes, wrung out of a mixture of lime-water and aqua ammoniæ.[3] Electricity may be tried, and general tonics.

§ 5. *Paralytic Ptosis.*

Palsy of the levator of the upper eyelid is an affection by no means uncommon. In one set of cases it bears an analogy, in point of cause, to the most frequent instances of palsy of the face, or, in other words, it arises from cold. In an another set, the cause is cerebral; it is, perhaps, arterial or venous congestion, sanguineous or serous effusion, or some tumour, formed within the cranium, and pressing on the third pair of nerves. It is often difficult, especially in the incipient stage, to distinguish these two sets of cases.

Paralytic ptosis, without any participation of the muscles of the eyeball, is rare. We find that, along with the depression of the upper eyelid, either all the muscles of the eyeball are paralyzed, so that the eye stands stock-still in the orbit, or much more frequently, that, from the abductor retaining its power, the eye is immovably distorted towards the temple (*luscitas*), while from the palsied state of the other recti, the patient is unable to move his eye upwards, downwards, or inwards. In the cases which are regarded as rheumatic, but which are probably as often apoplectic, one eye only is generally affected, and the abductor retains its power. In cases more decidedly cerebral, both eyes are apt to be affected from the beginning, although sometimes one side is first paralyzed, and then the other.

In paralytic ptosis, the orbicularis palpebrarum, preserving its power, keeps the eyelids constantly closed, so that the patient sees none, unless he raises the lid with his finger. When he does so, he sees double; and if he tries to walk across the room, is affected with a great degree of vertigo. The double vision and vertigo are owing to the axis of the palsied eye no longer corresponding to that of the sound one, and cease as soon as the eyelid is allowed to drop. In long-continued cases, the attempts of the patient to raise the lid by calling the epicranius into action, causes the eyebrow to become elevated and arched, and the skin of the forehead marked with transverse furrows.

The rheumatic variety of this palsy is brought on by exposure to currents of cold air, and the like. I saw it induced, on both sides, in a man who walked about all day, with his hat wet from having dropped it into a river. The cerebral variety is either sudden, or slow; the sudden, arising after fatiguing exertion, violent mental excitement, exposure to the direct rays of the sun, intoxication, blows on the head, concussion of the body, and the like; the slow, keeping pace with the growth of scrofulous tumours, fungous excrescences from the dura mater, and other organic changes about the basis of the brain.[4] The disease often wears an apoplectic aspect. An old gentleman walks quickly on a hot summer's day, along the banks of a river, in order to reach a small boat, in which he means to cross to the other side. He reaches the small boat, sits down in it, perspiring much about the head, and is instantly seized with a chill, and palsy of all the muscles of one eye under control of the motor oculi. I was called to see a military gentleman, who having spent the previous evening in celebrating the king's birth-day, amused himself next day in rowing a boat on the Clyde, over-heated himself, threw off his cap, but returned home in perfect health, and went to bed, in the evening, as usual. Next morning, on awaking, he was greatly alarmed by finding that he could not see. He had been seized with complete double ptosis; both eyeballs were twisted to the temples, and the pupils dilated. Both these patients recovered perfectly, under anti-congestive treatment. In an old man whom I saw, double ptosis, with loss of speech, and weakness of the limbs, occurred suddenly, and did not yield to remedies.

The third nerve is more obnoxious to palsy than any other of the cerebral nerves. This is perhaps owing to its position, as it emerges from the brain, between the posterior artery of the cerebrum and the superior artery of the cerebellum. Sometimes the former vessel traverses the trunk of the nerve. Congestion, then, of these vessels, may readily cause palsy of the nerve.

The vision of the eye which lies behind the palsied lid, may, or may not, be affected. We find from the commencement of the rheumatic variety, the pupil dilated, the iris partaking in the paralysis of the other muscles supplied by the third nerve; and this dilatation of the pupil is accompanied with the usual obscurity of vision met with in mydriasis. Generally it happens in the cerebral cases, that vision becomes gradually affected, but sometimes it is suddenly so from the first.

Treatment. When palsy of the upper eyelid appears to arise either from cold, or from some sudden cerebral affection, we employ general and local blood-letting, rest, the antiphlogistic regimen, and blistering of the head. After the use of these means, we generally find that the vertigo and other symptoms begin to yield. In both cases, we employ mercury till the mouth is affected, combining it in rheumatic palsy with opium, that it may act as a sudorific; in cerebral cases expecting it to prove useful as a sorbefacient. Warm fomentations of the eye are useful. Sudorifics, as guaiac, and stimulants, as camphor, have been highly recommended in the rheumatic cases. In the cerebral cases, low diet and the use of iodine are indicated.

Rubbing the forehead, the temple, and the palsied lid with the aromatic spirit of ammonia, issues in the neck, blisters to the brow, the raw surface being afterwards dusted with strychnia, and the use of electricity or galvanism, are attended with advantage. Exercise of the eye does good. A shade being placed over the sound eye, the diseased one should be forced into use.

In slow cerebral cases, I have seen almost every sort of practice tried without effect.

In an Infirmary patient, in whom the disease attacked first one upper eyelid, and then affected both, with a paralytic debility present also in one side of the body, the internal use of arsenic appeared beneficial. To enable this patient to attend a little to her household affairs, we were obliged to keep the eyes alternately open by a bit of adhesive plaister, attached to the lid and fixed by its other extremity to the brow.

A poor old Highlander, who applied at the Glasgow Eye Infirmary with double ptsosis, had contrived, by tying a pretty thick twisted band round his head, to keep up both upper eyelids very well. Although both his eyes were turned towards the temples, he did not complain of diplopia. The neatest contrivance for elevating the upper eyelid, in single or in double ptosis, is that of Dr. Mackness. A very thin and narrow piece of ivory, forming the segment of a circle is riveted upon a piece of the mainspring of a watch, about eight inches long. The loose end of the spring being carried through the hair over the crown of the head to the occiput, the piece of ivory is placed upon the eyelid so as to keep it open. The piece of ivory, being very narrow, is completely hid in a fold of the eyelid, while the spring being accurately painted to imitate the colour of the skin, is scarcely observable. As the eyelids occasionally require closing, in order to keep the eye moist, the patient soon acquires a knack of raising the spring to allow the eye to wink, and then replacing it again.[5]

Even in favourable cases, the power of the levator returns, in general, very slowly. We perceive, first of all, that the lid does not hang so flaccid, or so totally motionless as it did; but that as the patient exercises his volition in respect to it, it is affected with a tremulous oscillation and at length is raised a little from contact with the lower lid. Day after day, the degree of elevation is augmented, the iris comes into view, and by and by a part of the pupil, so that the sound eye being closed, the patient begins to discern the objects placed before him. Half the pupil is at length uncovered, and slowly more and more of the eyeball can be exposed, till the motion becomes as extensive and as rapid as in health.

Mr. Hunt's operation may be had recourse to in cases of double paralytic ptosis, when no signs of improvement appear; and even in single ptosis, if there be no luscitas. The epicranius is active, depending on the stimulus of the facial nerve, and the plan of bringing the lid under its influence deserves a trial. It has been proposed also to divide the abductor in such cases, if luscitas be present, and then perform Mr. Hunt's operation.[6]

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[1] Alessi, Annales d'Oculistique, 1er. Vol. Suppl. p. 39; Bruxelles, 1842.

[2] North of England Medical and Surgical Journal; Vol. i. p. 166; Manchester, 1830.

[3] Wenzel, Dictionaire Ophthalmologique, Tome ii. p. 6; Paris, 1808.

[4] See Case of Amaurosis and Paralytic Ptosis, with seizures of a mingled epileptic and paralytic character, in Bright's Reports of Medical Cases; Vol ii. p. 533; London, 1831. Case and Dissection, by Harc, from Aneurism of left posterior communicating artery, London Journal of Medical Science, September, 1850, p. 823. Case of Palsy of left side of face, ptosis, luscitas, deafness, and amaurosis, from tumour in pons, with hardness and tumidness of 3rd nerve; Edinburgh Medical and Surgical Journal, Vol. lviii. p 377; Edinburgh, 1842

[5] Medical Gazette; Vol. xxviii. p. 617; London, 1841.

[6] Curling, Medical Gazette; Vol xxviii. p. 16; London, 1841. Hunt, ibid. p 111. Holthouse, ibid. p. 152. Hall, ibid. p. 306.

SECTION XXXII.—LAGOPHTHALMOS.

From λαγὸς, *hare*, and ὀφθαλμὸς, *eye*; because it was believed hares slept with their eyes open.

The term *lagophthalmos* is employed to denote that state, in which one or other eyelid, or both, are shortened in their perpendicular diameter, so that they cannot be completely closed. (*Figs.* 4. and 5. p. 38). The consequence is that even during sleep, a part of the surface of the eyeball remains exposed to the action of the air, and the irritation of foreign particles. In some cases, even more of the eye is exposed during sleep than when the patient is awake. This state is generally the result of the contraction attending the cicatrization of a burn or other injury, or of retraction of one or other eyelid and adhesion to the edge of the orbit, in consequence of caries. In either case, lagophthalmos may or may not be attended with eversion of the affected lid.

I was, in one instance, consulted on account of a great degree of depression and retraction of the lower lid, without any eversion. As there was neither destruction of its integuments, nor disease of the bone, I was inclined to suspect that suppuration between the eyeball and the floor of the orbit, had been the cause of the diseased position of the lid, but nothing of this kind appeared from the history of the case to have happened. The substance of the retracted lid was much indurated, and ultimately became affected with cancerous ulceration.

I have already (page 183.) spoken of lagophthalmos as the result of palsy of the orbicularis palpebrarum.

A slight degree of lagophthalmos, especially if the lower lid only is affected, may not be attended by much inconvenience. When more considerable, inflammation of the conjunctiva and cornea, opacity and abcess of the cornea, and even staphyloma, may be the consequences. The exposed eye is incapable of the usual exertion, and is affected with epiphora and intolerance of light.

Treatment. Demosthenes and other ancient surgeons attempted to relieve the lagophthalmos which arises from a cicatrice, by making a crescentic incision through the contracted integuments, and endeavouring to keep the edges of the wound separate, as much as possible, by the interposition of dressings, till the cure was complete.[1] This plan was found to be ineffectual, as the cicatrice resulting from the very operation, necessarily gave rise to a new degree of contraction. Dieffenbach, however, ascribes the want of success to the incision being confined to the integuments, and recommends the adoption of the following among other operative means of cure: —

1. In small irregular cicatrices of the external integuments, excision of the cicatrice, the edges of the wound being brought very nicely together.

2. In transverse cicatrices, repeated sub-cutaneous division of the whole upper lid, including the cartilage; the lid to be then strongly drawn down, and fixed by plaisters, till the parts are healed.

3. In long, hard, elevated, vertical cicatrices, by which the middle

of the lid is particularly shortened, excision of the cicatrice by means of two long elliptical incisions. The edge of the shortened lid is laid hold of with a pair of toothed forceps, and drawn well downwards, one blade of a pair of small sharp scissors is passed between the eyelid and the eyeball, as high as the extremity of the cicatrice, and a long stripe of the lid inclosing the cicatrice is cut out. With insect pins, the edges of the incision are brought exactly together.

4. In cases of actual shortening of a sound eyelid, without any cicatrice, sub-cutaneous division of the levator. A small wooden spatula being introduced under the upper eyelid, a small concave-edged knife is made to perforate the eyelid at its temporal extremity, and as it is passed on under the skin to its nasal extremity, the muscle is divided.[2]

The lagophthalmos arising from caries of the orbit, is occasionally attended (*Fig.* 2. p. 32) by a considerable transverse elongation of the edge of the eyelid, at the same time that it is drawn into an angle, and immovably fixed in its unnatural position. Under these circumstances, an operation similar to one or other of those practised for ectropium, may sometimes be performed with advantage; such as, after extirpating the cicatrice, to extend from each extremity of the wound, an incision parallel to the edge of the orbit, dissect the integuments, on both sides, pretty extensively, and then transpose them, so that the seat of the cicatrice is covered and the lagophthalmos removed. Of course, nothing of this sort should be attempted till the bone has been long perfectly healed.

When, in consequence of the exposed state of the eye, the conjunctiva becomes inflamed in cases of lagophthalmos, advantage will be derived from the use of the lunar caustic solution, and the employment of such mechanical means as may moderate the access of light and air.

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[1] Actii Contractæ ex Veteribus Medicinæ Tetrabiblos; Tretrabib. II. Sermo iii. cap. 73; p. 360; Basileæ, 1549.

[2] Die Operative Chirurgie; Vol. i. p. 472; Leipsig, 1844.

SECTION XXXIII. — ECTROPIUM, OR EVERSION OF THE EYELIDS.

'Εκτρόπιον, *Actuarius*; from ἐκ, *out*, and τρέπω, *I turn*.

There is one *acute*, and there are several *chronic* varieties of ectropium. The acute depends on swelling and protrusion of the conjunctiva; the chronic arise in consequence of morbid contractions and adhesions, or of partial or total destruction, of the skin of the eyelids.

§ 1. *Eversion from Inflammation and Strangulation.*

Syn.—Acute eversion. Ectropium sarcomatosum.

Fig. Vetch, *fig.* I.

This variety takes place only when the conjunctiva is in a state of acute puro-mucous inflammation, such as in the Egyptian, or any other of the contagious ophthalmiæ. It may affect either eyelid, but the upper is much oftener affected than the lower; rarely both.

When sarcomatous ectropium affects the upper lid, the protrusion of the conjunctiva is often enormous, and the surface of the membrane presents in an extraordinary degree, that peculiar degeneration of the papillary structure of the conjunctiva, called *granular conjunctiva.* The mode in which this protrusion happens, has been well explained by Dr. Vetch.[1] The inflammatory œdema of the eyelids, which, in the contagious ophthalmiæ, is for a time excessive, beginning at length to subside, while no proportionate diminution of the swelling of the lining membrane of the lids has as yet taken place, the swollen and granulated conjunctiva loses that counterpoise which the external swelling afforded to it, and is forced outwards by the action of the orbicularis palpebrarum. If the protrusion is not immediately returned, the upper part of the eyelid and the retroverted cartilage act like a ligature on the parts protruded, and as the swelling increases, the stricture becomes still stronger by the natural but ineffectual efforts of the orbicularis to bring the tarsus into its proper position. The protruding tumour, therefore, is occasioned in a great measure by strangulation, like the swelling in paraphymosis.

When this eversion occurs in children affected with ophthalmia neonatorum, or some other severe puro-mucous ophthalmia, its origin is often in a great degree accidental. For example, the attendant, upon attempting to look at the eye, or remove the copious purulent discharge, unfortunately turns the upper eyelid inside out; the child begins to cry violently, this increases the eversion, and all attempts to reduce the lid to its natural position are found ineffectual. It is allowed to remain everted for some hours, or, as I have repeatedly seen it happen, for several days, and then the child is brought for advice. The everted lid is by this time greatly injected with blood; sometimes to such a degree, that pressure fails to overcome the eversion; or if we succeed in restoring the lid to its natural position, it very probably returns to the state of eversion, the moment that the child begins to cry.

When this variety of eversion affects the lower lid, there is nothing accidental in its production; it is entirely the result of the swelling and protrusion of the inflamed conjunctiva.

Treatment. The great object is to abate the inflamed state of the conjunctiva. If this is effected, the eversion will speedily be removed. We have recourse, in the first instance, to the application of leeches to the skin or to the everted conjunctiva, or we scarify the conjunctiva with the lancet. After the tumefaction of the eyelid is somewhat reduced by the discharge of blood, we are in general able to return it to its natural position. For this purpose, we lay hold of it in such a manner, with the thumb and forefinger of each hand, as to express from it as much as possible of the thin fluid effused into its substance, and then suddenly bend its edge towards the eyeball, at the same time that we push back the protruded conjunctiva. If the state of inflammation is not very acute, we ought to maintain the lid in its natural position by means of a compress and roller. If the ophthalmia be still severe, we must content ourselves with recommending great care on the part of the attendants to avoid whatever might cause the child to cry, and instruct them in the manner of reducing the eversion, should it happen to return. From day to day, or more frequently than once a-day, if this is thought necessary, the eye is to be examined, and the proper means applied to the conjunctiva for removing the ophthalmia, as lunar caustic in different forms, sulphas cupri, red precipitate salve, and the like. Every other remedy, general or local, likely to promote the cure of the original disease, is at the same time to be persevered in.

I have seen repeated instances in which scarification failed, or if we succeeded by its means in lessening the degree of eversion, it speedily returned. In such cases, I have sometimes succeeded in keeping down the lid by means of a piece of strongly adhesive plaister, or by collodion immediately covered with a piece of thick cloth placed across the lids. The plaister or the cloth, which is attached to the upper lid first, should be broad, then become narrow, and be fixed to the lower lid and to the cheek. Being narrow over the fissura palpebrarum, it allows the discharge to escape. I have, in other cases, found a circular band of vulcanized caoutchouc answer very well in keeping the upper lid in its proper situation.

All other means failing, we must extirpate a portion of the diseased conjunctiva. By means of a ligature, or simply with a hook, or a pair of toothed forceps, we raise up the middle of the exposed and thickened portion of that membrane, and remove, with the scissors, a fold of it of the shape of a myrtle leaf. The wound bleeds profusely, and this assists in reducing the lid to a state favourable for replacement. Strips of plaister, passing from the upper to the lower lid, and a compress and bandage, are then applied, and are to be renewed from time to time till the cure is complete.

Prognosis. It is important to observe, that although our prognosis in every case of this variety of eversion may be favourable, so far as the eyelid is concerned, we must pronounce nothing regarding the future vision of the patient, unless we are able distinctly to bring the cornea into view. In cases which have been neglected for a number of days, the swelling of the everted conjuctiva may be such, that we shall find it impossible to see the cornea, on our first examination of the eye; and under such circumstances we ought to forewarn the friends of the patient that we can promise nothing regarding sight. After the use of scarification and other means, we reduce the eversion and bring the cornea into view, but perhaps find the eye staphylomatous, and, of course, vision lost.

§ 2. *Eversion from Excoriation.*

Syn. — Chronic eversion. Ectropium senile.

Fig. Ammon, Zweiter Theil, Tab. V.; Dalrymple, Pl. II. *fig.* 2.

The most common cause of eversion is excoriation of the lower eyelid and cheek, in consequence of long-continued catarrhal ophthalmia, or ophthalmia tarsi. In this variety, we find the skin of the affected lid contracted, its tarsal edges rounded off, the Meibomian apertures partially or totally obliterated, the cilia destroyed, and a considerable portion of inflamed conjunctiva permanently exposed to view.

In children, this eversion is the result of neglected ophthalmia tarsi; in old persons, of chronic catarrhal ophthalmia. In the former, the misplaced state of the lid has generally been preceded by considerable superficial ulceration of the skin, the cicatrization consequent to which has shortened the lid, and dragged it downwards. In old persons, again, there is less appearance of cicatrization, while it would seem that the orbicularis palpebrarum has lost its power of supporting the lid, and that the tensor tarsi, being also weakened, allows the punctum lacrymale to fall forwards.

In the commencement of the disease, the exposed conjunctiva is swollen, presents a pale red colour, and possesses a natural degree of sensibility to the touch. Gradually, from the constant influence of the air upon a part not intended to be exposed to this excitement, and the occasional contact of external bodies, the conjunctiva of the everted lid assumes a redder and firmer appearance than natural, and at last becomes almost insensible to the contact of those substances which formerly excited pain or brought on bleeding.

The consequences of this disease are stillicidium lacrymarum, and occasional attacks of inflammation of the eyeball. Both these are the unavoidable effects of the interruption of the natural functions of the lower eyelid. In the state of eversion, it no longer covers completely and accurately the inferior part of the eyeball, which consequently remains exposed to innumerable causes of irritation, from which it ought to be guarded. In this state, also, the tears are no longer guided onwards to the punctum lacrymale, nor is the punctum kept in contact with the eyeball, as in health, so that the tears are allowed to drop over on the cheek.

If nothing is done to remove the eversion, and the cause in which it has originated is allowed to continue, the lid becomes transversely elongated, so that, were it liberated from its unnatural situation and raised into contact with the eye, it would be found not to fit exactly, being longer than sufficient to cover accurately the surface of the eyeball.

Eversion of the upper lid from excoriation rarely occurs, and never to any great extent.

Treatment. 1. By the use of the appropriate means, we endeavour to remove the remaining symptoms of the ophthalmia, which has given rise to the eversion.

2. The contracted state of the skin is to be relieved as much as possible, by frequently fomenting the lids with warm water, then drying them, and anointing them with oxide of zinc ointment. This softens the skin of the everted lid, renders it more pliable, and protects it from farther irritation.

3. Scarification of the exposed conjunctiva is highly useful, as well as the keeping of the lid raised to its natural position, by means of a compress and roller, carefully applied.

4. The application of escharotics to the internal surface of the lid

is, in general, an effectual means of counteracting the tendency to misplacement in this variety of eversion. The sulphate of copper, or the nitrate of silver, solid, or in solution, will be found to answer well. Some surgeons[2] venture on the employment even of sulphuric acid for this purpose.

The upper lid is to be raised by the finger of an assistant, and the patient is to look upwards; then the surgeon, everting the conjunctiva of the lower lid as much as possible, and wiping it dry, passes the nitrate of silver pencil along its surface, which instantly becomes white; after which it is to be touched with a little water, by means of a camel-hair brush.

If sulphuric acid is preferred, a bit of wood or the blunt end of a common silver probe, is to be dipped in that fluid, and rubbed upon the conjunctiva of the lid, carefully avoiding the punctum lacrymale, caruncle, semilunar fold, and eyeball. The portion of conjunctiva touched by the acid immediately becomes white; and, in order to prevent the acid from affecting the eyeball, a stream of water should now be directed over the eyelid, by means of a small syringe. If the acid does not appear to have made the conjunctiva sufficiently white, the application may be repeated with the same precautions.

The application of the caustic, or of the sulphuric acid, should be repeated every fourth day. Neither of them causes a slough, but merely a general contraction of the part, and, after two or three applications, an evident diminution of the eversion. The escharotic applications must be continued from time to time, till the lid assumes its natural direction.

5. Should the means already indicated prove ineffectual, a portion of the relaxed and thickened conjunctiva must be extirpated. In order to execute this with exactness, it is necessary to estimate beforehand about what amount of contraction of the conjunctiva would be sufficient to re-instate the eyelid in its natural position. If we remove too little, a degree of eversion will remain. If we remove too much, we produce a new disease, namely, inversion, which is at least as bad as that which we have been endeavouring to relieve. The operation and after-treatment are the same as have already been mentioned under the first variety of eversion. If our calculation in the quantity to be removed has been correct, we find the ectropium cured as soon as the conjunctiva has healed.

6. In very bad cases of this sort we may, with advantage, have recourse to the removal of a wedge-shaped portion of the whole thickness of the lid; an operation we are frequently obliged to employ in the third variety of eversion.

7. Dieffenbach has proposed an operation, by which the everted lid is at once brought into its proper position, and the natural antagonism, which ought to exist between the internal and external structures of the affected lid, restored. He removes no part of the conjunctiva or of the tarsus.

The integuments being pinched up into a fold, they are to be divided by an incision, parallel to the lower edge of the orbit, and a few lines above it. This incision is to extend to two-thirds of the transverse breadth of the lid. The semilunar flap, formed by the incision, is to be dissected upwards, as far as the adherent edge of the tarsus, which in eversion is nearer the eyeball than the free edge, and there the lid is to be penetrated, and the conjunctiva divided to the extent of the external wound. By means of a hook, the conjunctiva, along with the tarsus, is now to be drawn into the external incision, and fixed there by the twisted suture.

A similar operation may be practised on the upper lid.[3]

§ 3. *Eversion from a Cicatrice.*

Fig. Ammon, Zweiter Theil, Tab. V.

The cicatrice which operates in the production of this variety of eversion, is generally the consequence of a wound, an abscess, an ulcer, or a burn. In such cases, though nature contrives to produce, in place of the portion of skin which has been destroyed, a supplementary substance, yet matters are not restored exactly to their former state. The ulcer is covered, partly at the expense of the surrounding sound skin, which is drawn together and contracted over the sore, and partly by the formation of a new membrane, which, though we give it the name of skin, possesses but imperfectly the properties of the old integuments. It is neither so large as the piece of skin which has been lost, nor is it so yielding, nor so elastic, nor so moveable upon the part which it covers. It is smooth and shining, and scarcely capable of distention; but above all, so far as the present subject is concerned, the surrounding original cutis is drawn towards this supplementary production, is puckered and thrown into folds, and, to use the homely comparison of Mr. Hunter, the whole appears as if a piece of skin had been sewed into a hole by much too large for it, and therefore it had been necessary to throw the surrounding old skin into folds, or gather the surrounding skin, in order to bring it into contact with the new.

A lacerated wound of either eyelid, allowed to heal without due attention, is very apt to end in eversion. The upper lid particularly we sometimes see completely everted, and peaked up into an angle, in consequence of a neglected or mismanaged laceration.

From severe burns, the eyelids are generally much puckered, contracted, and indurated; and not unfrequently both the upper and lower are affected with ectropium. The skin having been destroyed, from the margin of the eyelid to the eyebrow, or to the cheek, the lid is folded completely back, and adheres throughout its whole length to the edge of the orbit. It often happens, that the skin round the everted eyelids having also suffered, it is replaced by a hard unyielding cicatrice, stretching to the forehead, nose, cheek, and temple.

The displacement being much greater in cases of this variety of eversion than in that which results from mere excoriation, the effects are still more annoying to the patient. The eye is more exposed to the contact of foreign substances, suffers oftener from inflammation, and is in a greater degree disfigured. The feeling of cold in the eye, from want of the covering naturally afforded by the lids, is often distressing.

The degree in which the everted lid is dragged from the eye is sometimes astonishing, and the consequent deformity actually hideous.

For example, Cloquet notices[4] the case of a patient in the *Hôpital Saint-Louis*, who had eversion of each lower lid, in consequence of syphilitic ulcers of the face. The left lower lid was drawn down to the outer part of the upper lip. The tarsus had not been destroyed, but elongated; and formed, on a level with the lip, a slight-curved elevation of a whitish colour, from which proceeded the cilia.

Treatment. Such being the origin and effects of this variety of eversion, it comes to be a question how far it is curable, or in other words, whether there be any method of removing or counteracting the contraction arising from cicatrization.

This contraction, so far from diminishing of itself, gradually increases for some time after the process of cicatrization appears completed, in consequence of the absorption of the granulations, on which the new skin is formed. Matters then appear for a while to remain stationary; but in the course of years, the everted eyelid will have loosened itself a little from its unnatural situation, and not quite so much of the eyeball will be exposed. In consequence of the mechanical motion to which the parts are subjected, a slight increase takes place in the flexibility of the cicatrized surface, and it becomes somewhat less firmly attached to the subjacent textures. The parts, which were at first matted immovably together, yield a little to the motions impressed on them by external causes, and the absorbents appear to contribute to this slight relaxation, by removing some of the adventitious substance which bound down the integuments. This is all the return which is ever made to the natural state by the action of the parts themselves.

The hand of art, however, has sought to relieve, not only the present variety of eversion, but similar consequences of cicatrization in various parts of the body, by a more speedy and effectual method. Celsus gives[5] us an account of the operation, practised in his time, for the cure of this kind of eversion. It is the same operation as that employed by the ancients for lagophthalmos, and to which I have referred in the last section. When the disease was situated in the upper eyelid, an incision, down to the cartilage, was made, in the form of a crescent, the extremities of which were turned downwards. When the disease affected the lower lid, an incision of the same form was made there, the extremities still pointing downwards. The edges of these incisions were kept open as much as possible, by means of lint put into the wound, so that they healed up by a slow process of granulation and cicatrization. It was expected that the space between the edges would be filled up by new substance, that the eyelid would consequently be considerably elongated, and would return to its natural position, or in other words, that the eversion would be cured.

This operation has been frequently tried in later times; but so far from permanently curing eversion, it has often been found in the end to increase the very disease it was intended to relieve. Immediately after the incision, indeed, the eyelid can perhaps be brought nearly, if not altogether, into its natural situation; and so long as the process of granulation is going on, the case continues at least much better than it had been before. As soon as the wound is healed, however, it is found that the eversion has begun to return, and at the end of some months, matters are probably rather worse than they were before the operation.

1. *Extirpation of conjunctiva.* The following case, by Bordenave, sufficiently illustrates both the failure of the ancient operation, and the good effects of extirpating a portion of the conjunctiva, in this variety of eversion:—

Case 151.—A man, aged 21 years, had eversion of the right lower eyelid, from a cicatrice, the consequence of a burn of the face, which happened in infancy. The eversion was considerable, the protruding part of the eyelid presented a redness disagreeable to look at, and the eye could not be covered by the lids. Bordenave found the cicatrice considerably flexible, and believed himself justified in hoping for a cure by the ordinary operation, which he performed some days afterwards, according to the prescribed rules.

Having made a semilunar incision of moderate depth, below the tarsus, he separated the lips of the wound with charpie, and kept them in this state by adhesive plaisters, compresses, and a suitable bandage. Some days afterwards, suppuration took place. The eyelid appeared extremely relaxed, it covered almost entirely the eye, and the cure seemed certain. But these appearances of success were not of long duration; the cicatrice being completed, and the eyelid no longer restrained, things returned to their former state. Not convinced, however, of the faultiness of the operation, Bordenave believed that he had not performed it with sufficient exactness; and therefore repeated it, but with no better success. He says that he should now have despaired of curing the case, had not the patient's eagerness to be relieved forced him in some manner to try a different treatment.

Seeing that he was unable to elongate the eyelid, in order to conceal the everted conjunctiva, he resolved to remove a portion of this membrane in almost all its length. This he did with a straight bistoury, and found the operation exceedingly beneficial. Some time after, the conjunctiva still protruding a little, he practised a second excision, which had all the success desired. In proportion as the conjunctiva cicatrized, the eyelid returned to its proper direction, it applied itself more immediately upon the eye; at last the eye closed much better, and the deformity became scarcely visible.[6]

In many cases, then, of eversion, arising from a cicatrice, the simple operation of removing the palpebral conjunctiva may be sufficient.

2. *Separation of unnatural adhesions, and extirpation of conjunctiva.* We meet with cases of eversion, caused by an external cicatrice, in which the dragging of the lid is too great to permit us to hope that the counteraction of an internal cicatrice will of itself suffice to restore the part to its natural situation.[7] Under such circumstances, it may be proper to set free the everted lid from its morbid adhesions, and then to extirpate the conjunctiva. An incision being made through the cicatrice, or beyond it, and parallel to the everted cilia, the external surface of the lid is to be cautiously dissected from the parts to which it is bound down, so that it may be returned to its natural position. More or less of the conjunctiva, according to the degree of the eversion is then to be removed; after which compresses and a roller are to be applied, to keep the eyelid in the position to which it has been reduced, till the conjunctiva heals, and the external wound is cicatrized.[8] Professor Chelius, however, does not trust to compresses and a roller, but to keep the edges of the wound apart till it granulates and cicatrizes, he passes two loops of thread through the skin of the eyelid, near its edge, and fastens them by plaisters to the cheek, if it is the upper lid; to the brow, if it is the lower lid. Dzondi dressed the wound with resinous ointment mixed with can-

tharides, to insure a sufficiently copious process of granulation before cicatrization should commence. He then applied lunar caustic, in order to heal the wound quickly, a practice against which Chelius warns us, as exceedingly likely to cause absorption of the granulations, and thus to defeat the object of the treatment.

It is rarely the case, that one operation of the sort now under consideration, suffices to cure a bad ectropium. Repeated operations are frequently necessary, a farther amendment being accomplished by each, till the lid or lids are restored to their natural position.

3. *Separation of unnatural adhesions, and perpendicular transposition of a quadrangular flap.* In cases of adhesion of the eyelid to the upper or lower edge of the orbit, Dr. Ammon proposes the following operation. The integuments, to the distance of an inch from the place of adhesion, being put on the stretch, so that the morbid connection of the eyelid to the orbit, is brought completely into view, let an incision be made parallel to the edge of the orbit, and about half an inch distant from it, somewhat more extensive than the morbid adhesion. From the ends of this incision, carry two other smaller incisions to the edge of the orbit. The flap, thus circumscribed, is now to be dissected from the subjacent parts, taking care not to cut through the thin hard eyelid, where it adheres to the edge of the orbit, and avoiding, in the upper lid, the lacrymal ducts. The dissection being finished, and the wound cleared of blood, the eye is to be shut, and sutures applied, so that the eyelid may remain in the state of replacement and elongation to which it has been restored by the operation.[9] The objection to this mode of operating is, that a large wound will be left to fill up by granulation.

4. *Perpendicular transposition of a triangular flap.* The following case illustrates a mode of operating, which Mr. Wharton Jones has found successful in eversion and shortening of the upper eyelid, from contraction of the skin consequent to burns. The peculiarity of the plan consists in the two following particulars: 1. The eyelid is set free by incisions made in such a way that, when the eyelid is brought back into its natural position, the gap which is left may be filled up by approximating its edges, and thus obtaining immediate union. Unlike the Celsian operation, the narrower the cicatrice the more secure the result. 2. The flap of skin, embraced by the incisions, is not separated from the adjacent bone, but advantage being taken of the looseness of the cellular tissue between the skin and the bone, the flap is pressed downwards, and thus the eyelid is set free. The success of the operation depends on the looseness of the cellular tissue. For some days before the operation, therefore, the skin should be often moved up and down over the frontal bone, to render the cellular tissue more yielding.

Case 152.—A woman, aged 24, had her face much scarred. Both eyeballs were quite exposed, on account of shortening and eversion of the upper eyelids. On the left side, the eversion of the upper eyelid was not so great as on the right. On this side, the ciliary margin of the tarsal cartilage corresponded to the edge of the orbit, and the opposite margin of the cartilage occupied the usual position of the tarsal margin, so that when an attempt was made to close the right eye, it was the orbital margin of the tarsal cartilage which was pressed down. There was some degree of shortening and eversion of the left lower eyelid. The patient saw very well with the right eye, but with the left, on account of some opacity of the cornea, she did not see well enough to recognise a person. At the age of one year and three months, she fell into the fire, and had her face severely burned, which was the cause of the state above mentioned.

Two years before coming under the care of Mr. Jones, she had an operation performed on the left eye, and was improved by the operation. The eversion had probably only been lessened by the operation, for the shortening of the upper eyelid was still very great.

On the 22d February, 1836, Mr. J. operated on the left upper eyelid. He made two incisions through the skin, from over the angles of the eye upwards. The incisions converged towards each other, and met at a point somewhat more than an inch from the adherent ciliary margin of the eyelid. By pressing down the triangular flap thus made, and cutting all opposing bridles of cellular tissue, but without separating the flap from the subjacent parts, he was able to bring down the eyelid nearly into its natural situation by the mere stretching of the subjacent cellular tissue. A piece of the everted conjunctiva was snipped off. The edges of the gap, left by the drawing down of the flap, were now brought together by suture, and the eyelid was retained in its proper place by plaisters, compress, and bandage.

During the healing of the wound, a small piece of the apex of the flap, which had been too much separated from the subjacent parts, sloughed. By the 1st April, the parts were healed, and the eversion completely cured. The cicatrice, where the part sloughed, was pretty broad. When the bandages were first left off, the eyelid was so much elongated, that if the lower lid had not also been shortened, the eye would have been entirely covered. After leaving off the bandages, some shortening took place, not from contraction of the cicatrice, but of the skin. Being no longer on the stretch, the skin assumed, as it contracted, more of its natural appearance.

About the middle of March, Mr. J. operated on the right upper eyelid. He made the incisions in a similar way, except that they did not meet in a point, a space being left between their extremities of about one-sixth of an inch in length, which was divided by a transverse cut.

By the stretching of the subjacent cellular tissue, Mr. J. succeeded in drawing down the flap, and thus elongated the eyelid so much as to cover the eye entirely; but in consequence of the long-continued displacement of the tarsal cartilage, the ciliary margin of it did not come into contact with the eyeball. He did not inter-

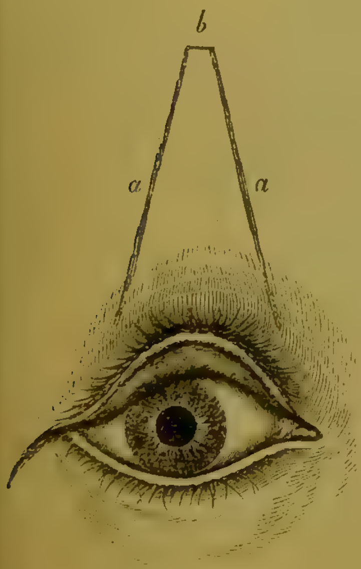

Fig. 17.

Fig. 17. *a a* Converging incisions. *b* Cross-cut uniting them. These three incisions enclose the flap, which is slid down by the yielding of the cellular tissue.

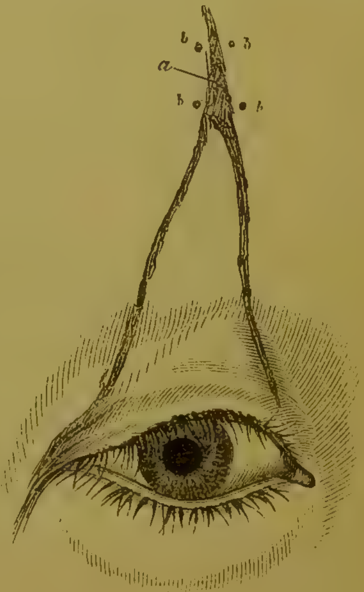

Fig. 18.

Fig. 18. shows the parts when healed. *a* The cicatrice where the gap was. *b b b b* The marks of the sutures.

fere with this state of parts, by attempting any transverse shortening of the lid. In the operation, he removed a piece of the everted conjunctiva, and with it a bit of the tarsal cartilage. From the surface of this wound there sprung out a small soft fungus, which was cut off with the scissors, and the root touched with the lunar caustic pencil.[10]

5. *Separation of unnatural adhesions, extirpation of conjunctiva, and excision of a wedge-shaped portion of the eyelid.* When the edge of the everted eyelid is much elongated from canthus to canthus, the integuments of the lid destroyed, and its remaining substance firmly adherent to the bones forming the edge of the orbit, the following plan, first practised by Sir William Adams[11], may be adopted with advantage:—

In the *first* place, the everted eyelid is to be separated from its unnatural adhesions. In the *second* place, the palpebral conjunctiva, especially if it be much thickened, is to be extirpated. In the *third* place, in order to counteract the morbid elongation of the eyelid from the outer to the inner canthus, a portion of the whole thickness of the eyelid, of the shape of the letter Λ (*Fig.* 19.), is to be cut out with the scissors, after which, the edges of the last wound are to be brought together with an insect pin or two, and a twisted thread. This makes the eyelid sit close upon the eyeball, as in health, and completely cures the eversion.

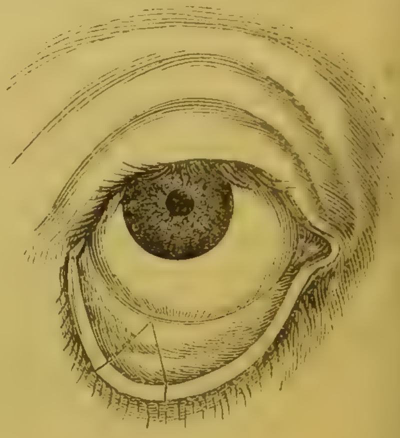

Fig. 19.

The wedge-shaped portion has generally been removed from the middle of the lid; but as the scar which results, produces some degree of deformity, it is preferable to cut out the piece near the temporal extremity, as here the scar is less apparent, and produces less interruption of the motions of the part. The size of the piece to be removed, depends on the degree of the transverse elongation of the everted eyelid, and must therefore be left to the judgment of the operator. He must avoid cutting out too much, as, in this case, the parts will be so shortened, that the edges of the wound will not be brought into contact without stretching them so as to produce ulceration, thereby detaching the parts before union is effected, and leaving them in a worse condition than they were at first.

By the speedy union of the edges of the wound left by the excision of the wedge-shaped portion, the eyelid will be retained in its place, and the danger of the integuments re-adhering to the orbit be, in a great measure, prevented. To aid, however, in the cure, the eyelid should be covered with a spread pledget, and supported, against the eyeball, by a compress and roller. The opposite eye should be closed and covered, so that it may be kept at rest. The following case shows how the operation may be sometimes modified, and the eyelid supported in a different way, from that just mentioned.

Case 153.—In a case of eversion of the lower eyelid, Professor Gräfe first cut out a wedge-shaped portion of the eyelid, and united the edges of the wound by means of the harelip suture; but just before twisting the thread round the pins, he divided the skin of the cheek to the extent of 1¼ inch by an incision concentric with the edge of the orbit. He then twisted the threads, drew the ends of them upwards, and fixed them to the forehead by sticking plaister, so that the edge of the lower eyelid might be raised sufficiently. The incision through the skin of the cheek was thus made to gape, and in order to heal it with a broad scar, the edges were kept separate by a crescentic plate of lead, which was pressed in between the lips of the wound, and retained by strips of plaister. The wound of the eyelid was quite united on the third day, and that into which the plate of lead was inserted was cicatrized in the fourth week, the size and situation of the eyelid appearing natural.[12]

6. *Separation of unnatural adhesions, excision of a portion of the edge of eyelid, perpendicular and lateral extension of the eyelid and neighbouring integuments.* When the deformity is considerable, in cases of lagophthalmos or ectropium, produced by cicatrization, both the transverse and perpendicular diameter of the eyelid are faulty in their dimensions. The perpendicular diameter, or breadth of the eyelid, is shortened; the transverse diameter is elongated. An operation has been proposed by Professor Jäger of Vienna, the object of which is to increase the perpendicular length of the eyelid, as well as to reduce its transverse elongation.

Before proceeding to the operation, the difference in the length of the edge of the everted lid, and of the sound lid on the other side of the face, is to be accurately measured. In the operation, the transverse length of the everted lid is to be reduced to that of the sound one.

In operating on the upper lid, the surgeon begins by taking hold of it about the centre of its edge, with a hook or forceps, and drawing it downwards so as to put on the stretch the cicatrice, by which the lid adheres to the margin of the orbit. A horn spatula may be inserted between the lid and the eyeball, so as to protect the latter. With a small scalpel, a transverse incision is now to be made, about midway between the edge of the everted lid and the superciliary arch. The incision is to be commenced and terminated in sound skin, and is to be carried through the whole thickness of the lid, so as to permit its edge to fall down, and the eyeball to appear through the slit which has thus been formed. The length to which the incision is to be carried must depend on the circumstances of the case.

The narrow slip separating the natural rima palpebralis from the artificial opening formed by the incision just described, is the part in which the reduction of the transverse diameter of the lid is to be made. The size of the portion which ought to be removed, is already known from the measurements made before the operation was commenced. The portion removed will generally have a quadrilateral form. With forceps and scissors, this part of the operation is easily effected.

A straight double-edged scalpel is now to be used, for separating any unnatural adhesions of the lid, and for detaching the integuments from the os frontis. Taking hold of the upper lip of the wound with the forceps, and separating it a little from the edge of the orbit, the scalpel is to be introduced upwards, between the posterior surface of the orbicular muscle and the anterior surface of the frontal bone. The scalpel is now to be carried with a sawing motion towards the temple and external canthus, and then towards the middle line of the forehead, without enlarging the original wound of the lid, transfixing the skin, or injuring the periosteum. By this process, the skin and muscle covering the supra-orbital region and angles of the orbit are loosened from the subjacent parts, and rendered capable of undergoing a change in their position. The height to which the scalpel will require to be carried, and the extent in the transverse direction to which the integuments ought to be detached, must always be proportionate to the loss of the palpebral substance, and the different degrees of mobility of the skin of the forehead.

The wounds are now to be united by the interrupted suture. In the first place, the bridge or narrow slip of the lid, whence the quadrangular portion was removed, is to be united by two stitches. Then the integuments which have been loosened from the supra-orbital space and angles of the orbit, are to be pressed downwards by the assistant, over the eyeball, so that the edges of the transverse wound of the lid may be brought together. A stitch is to be inserted near the middle of the transverse wound, so as to act as a central point of traction upon the surrounding integuments. Should the upper lip of the wound not much exceed the lower lip in length, lateral stitches may be immediately inserted; if, on the other hand, it exceed to the extent of forming a fold, this must be removed by the scalpel or scissors, in order that the edges of the wound may be nicely adjusted. The number of stitches required cannot *à priori* be determined.

Coaptation of the wound having thus been effected, the eyeball is covered by integuments obtained partly from the supra-orbital region, but chiefly from the angles of the orbit; the eyebrow, however, will be somewhat more depressed, and describe a smaller and less convex arch than formerly.

Professor Jäger's operation upon the lower eyelid consists in removing a wedge-shaped piece from its edge, and in detaching the integuments from the margin of the orbit and the cheek, by a similar process to that already described for increasing the perpendicular diameter of the upper lid.

The stitches are to be supported by interposing narrow strips of court plaister. The wounds are then to be covered with small pieces of lint, and graduated compresses are to be placed upon the supra-orbital region, or cheek, according as the operation has been performed for the restoration of the upper or lower lid. Over the graduated compresses long strips of adhesive plaister are to run, being applied in such a manner as to draw the integuments towards the lid, and approximate them to the bones. When the upper lid has been operated on, the adhesive plaister may extend from the nape of the neck to the cheek. A roller may be applied to assist the action of the plaisters, if it be deemed necessary. In the after-treatment, nothing ought to be omitted likely to effect union by the first intention.

Smart inflammation, requiring active treatment for its removal; nausea and vomiting, demanding the use of opium and effervescing draughts; premature removal, from accident, of one or more of the stitches; and ulceration of the edges of the wounds; are among the unfavourable occurrences which occasionally supervene to the operation.[13]

7. *Tarsoraphia.* It occasionally happens from an extensive burn, that both eyelids are everted, and dragged towards the temple. In such cases, besides dividing the cicatrice, removing part of the exposed conjunctiva, and perhaps cutting out a portion of the whole thickness of one or of both lids, it has been found useful to pare away a portion of the edges of the lids at their outer angle, and then to bring the two together by a stitch. This *tarsoraphia,* as it has been termed, reduces the opening between the lids to its natural length, and removes much of the deformity.

A somewhat similar practice was followed by Le Dran, in a case of eversion of the lower lid, at the inner angle of the eye. He removed the thickened conjunctiva, extirpated the cicatrice, and brought the edges of the wound together by two stitches.[14] Professor Walther has published[15] a case of traumatic eversion of the external angle of the lids, cured by the same plan.

8. *Extirpation of cicatrice, and bringing together of the integuments from each side.* The lower lid being the seat of the ectropium, Dieffenbach removes a triangular flap of skin, including the cicatrice, of nearly three inches in length, the basis corresponding to the edge of the lid. With four or five pins, he brings the edges of the lower part of the wound together, in a vertical direction, and then the remaining parts of the wound, diverging from each other, are united in the same way to the edge of the tarsus. Zeis describes this method somewhat differently. The triangular portion of integuments, including the cicatrice, being removed, the incisions *c a, c a* (*Fig.* 20.), are extended freely on each side, to allow of the ready approximation of the two sides, *b, b.* These being fixed by sutures, the two edges *a c, c a,* are now connected to the corresponding margin of the lower lid, included between *c c.* The appearance after the sutures are applied, is such as is represented in *Fig.* 21.[16]

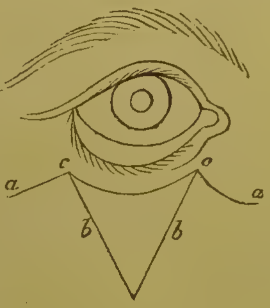

Fig. 20.

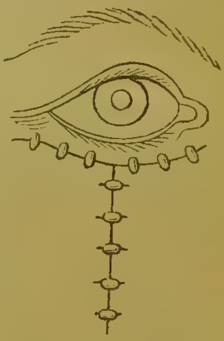

Fig. 21.

A similar operation was practised by Dieffenbach for eversion, involving both eyelids and their external commissure. He extirpated the commissure, along with a triangular piece of the neighbouring integument, the basis of which was towards the eye, and the apex towards the ear. One curved incision was then carried above the supra-orbitary arch, and another beneath the lower orbitary margin, towards the nose, each incision measuring about 1½ inch in length. The two crescentic flaps thus formed, were then raised, and after bringing them over the triangular wound, they were adapted as new lids to the remaining conjunctiva.[17]

9. *Extirpation of cicatrice, and lateral transposition of a triangular flap.* Operations for the relief of ectropium by transposing a portion

of skin, are styled *blepharoplastic.* With respect to such operations, in general, it may be remarked, that though we cannot pretend to make a perfect eyelid by the transposition of a piece of skin, destitute of mucous lining, as well as of cilia, lacrymal apparatus, cartilage, and muscles; yet a new eyelid, even of mere skin, covers and protects the eye, lessens deformity, and frees the patient from suffering. In attempting to supply a new eyelid, we should save the conjunctiva as much as possible, cutting none of it away, but separating it, if necessary, from the diseased integuments. We ought to lay the flap of transposed skin on the conjunctiva, so that they may adhere together. We should save, with the same care, the border of the old eyelid, with its cilia, and unite it by sutures to the edge of the flap. The puncta and lacrymal canals ought also to be spared. As it is not likely that the new eyelid will possess much muscular motion, we must avoid making it either too large or too small.

Dieffenbach appears to have tried many ways of forming new eyelids by transposition of skin. The following does not appear to have ultimately retained his good opinion, as he says nothing of it in his latest work, *Die Operative Chirurgie.* As it was successfully adopted, however, not only by himself, but by Lisfranc, Ammon, Eckström, Blasius, Fricke and Chelius, I think it proper still to describe it.

The cicatrice is first to be extirpated, and a triangular form given to the wound, the basis of the triangle being always turned towards the eye. In this part of the operation, the ciliary edge of the eyelid, if present, is to be preserved; but if ulceration has destroyed the whole eyelid, except the conjunctiva, this membrane is to be detached from the parts to which it adheres, in the course of a line drawn from the inner to the outer angle of the eye, and laid out upon the eyeball. The triangular space being thus prepared, into which the flap of skin is to be transplanted, an incision is to be made from the temporal extremity of the basis of the triangle, in the direction of the meatus auditorius externus, whether it be the upper or the lower lid which is to be supplied. This incision of the skin should be considerably longer than the basis of the triangular wound. From the temporal extremity of this incision, another is now to be carried upwards, if it is the upper lid which is to be supplied, downwards, if it is the lower, and in either case parallel to the temporal edge of the triangular wound. These incisions are the boundaries of the flap, which, being transposed, is to form the new eyelid. The flap is now to be dissected from the subjacent parts. The bleeding having ceased, and the internal surface of the flap being freed from coagulated blood, the flap is to be drawn from without inwards, so that its inner edge is brought into contact with the inner edge of the triangular wound. These two edges are first of all to be steadied by a stitch at the inner canthus; then, the tarsal edge of the flap and the conjunctiva are to be brought together by fine silk stitches; and lastly, the inner edge of the flap is to be connected by Dieffenbach's suture to the internal edge of the triangular wound. Except by Chelius, the temporal edge of the flap is not connected by sutures. The triangular space left by the transposition of the flap, is generally covered with lint and adhesive plaisters, so applied that they serve also to support the new eyelid in its place. Should suppuration take place, in the course of the cure, beneath the transposed flap, the matter formed will escape from under its temporal edge. Cold applications are recommended, as most likely to promote speedy adhesion, and prevent suppuration.[18]

Case 154.—Mrs. S. had the misfortune to have her face sadly disfigured by syphilis. She lost her nose; her upper lip was so much shortened, that she could not cover the teeth of the upper jaw; the left upper eyelid was destroyed, and the lower in a state of complete ectropium. Several extensive cicatrices on the hairy scalp and forehead showed the previous existence of necrosis, with exfoliations of the outer table of the skull. A considerable portion of the upper, outer, and lower edge of the orbit had been lost in this way. The greater part of the left upper eyelid was so completely removed by ulceration, that its remains surrounded merely, without covering, the eyeball. The conjunctiva of the small portion which remained was turned outwards, and its tarsal edge very irregular.

Dr. Ammon began his operation by insulating and separating from the temple the flap of skin, by which the defective upper eyelid was to be supplied; he then divided all the adhesions of the old eyelid, and prepared the place for the reception of the new one. He formed the flap by a horizontal incision two inches and a half in length, to which he joined a perpendicular one, bounding the flap towards the temple, and then dissected it off. He reduced the shrunken remains of the old eyelid with the bistoury; but unfortunately found it impossible to separate enough of conjunctiva from it, to form a lining membrane for the new eyelid.

As soon as the bleeding had ceased, the flap forming the new eyelid having been brought into such a position that it covered the eye, it was secured along its inner edge by Dieffenbach's suture; and thus ended the formation of the upper eyelid.

To remedy the ectropium of the lower eyelid, Dr. Ammon first of all carried an incision through the skin, parallel to the edge of the lid, and then dissected it from its unnatural adhesions; he next extirpated a horizontal fold of the exuberant conjunctiva; and lastly, having made a cut like a button-hole through the lid, about 4 lines from its edge, by means of a ligature, he laid hold of that part of the conjunctiva which still remained attached to the tarsal portion of the lid, drew out the ligature through this wound, and so fixed the lid in its natural position.

At the temporal angle, the upper and lower eyelids were now connected by the twisted suture, which, after some hours, was removed, Dr. Ammon fearing that thereby the fissura palpebrarum might be made too small. The wound on the temple, caused by the transplantation of the new eyelid, was covered with charpie, and a thick compress wet with water.

Next day, the transplanted skin was somewhat swollen, so much so that the fissura palpebrarum was no longer visible, and the eyeball was entirely concealed. By injecting tepid water, Dr. Ammon removed the matter which collected on the eye; but, notwithstanding this precaution, a considerable œdema of the conjunctiva took place. Union of the inner edge of the transplanted flap was not entirely effected by the first intention, so that, as the stitches were gradually withdrawn, strips of sticking plaister were applied. The wound on the temple granulated favourably. The cut through the lower eyelid, into which the conjunctiva had been drawn, closed perfectly; so that the eyelid, after the œdema had subsided, maintained its proper position.

The granulation of the wound on the temple proceeded, and along with it the formation of the new outer canthus. Three weeks after the operation, the fissura palpebrarum appearing too small, Dr. Ammon slit up the outer canthus as far as the edge of the orbit, and endeavoured to prevent re-union by the introduction of charpie between the lips of the wound. Notwithstanding this, he was obliged, two months afterwards, not only to slit up the outer canthus again, but to extirpate a stripe of skin, so as to give to the fissura palpebrarum the proper degree of length; in which he completely succeeded.

The transposed flap forming the upper eyelid, assumed more and more of a natural appearance. The middle of it, however, continued to be œdematous and of a bluish colour, till, on forming a new nose for Mrs. S. out of her forehead, erysipelas came on and spread to the new eyelid; after which the œdema became greatly less, and at last vanished entirely.

Seven months after its formation, the new eyelid closed over the eyeball, without irritating it; it could be lifted from it like a natural eyelid, but generally hung over it in a state of semi-ptosis. The cicatrice on the temple was very small, so that it was difficult to believe that so considerable a portion of the integuments had been taken from that part.[19]

10. *Transplantation of a crescentic flap from the temple or the cheek.* Professor Jüngken proposed to extirpate the cicatrice, and then dilate the wound, so that by giving the lid sufficient length, it might assume its natural position. A piece of pasteboard was then to be taken, of the exact size and shape of the wound, and laid on the cheek, if the lower lid was the seat of the eversion; on the temple, if it were the upper lid. The piece of skin covered by the pasteboard, except a narrow slip, which was to be left undivided, was now to be insulated by an incision; it was to be dissected from the parts it covered, with as much cellular substance attached to it as possible; and then twisted round into the wound left by the extirpation of the cicatrice. The bleeding was to be stopped by the application of cold water, the clotted blood removed, and the edges of the supplementary piece of skin connected with those of the wound left from the extirpation of the cicatrice, by means of stitches, strips of plaister, and a bandage.

When there was reason to think that organic union had taken place between the piece of skin and the subjacent surface, the connecting slip was to be divided, and returned as much as possible to its original place. The stitches were to be removed at the proper time, and the parts secured by sticking plaister alone, till entire union and cicatrization were effected. The wound caused by the abstraction of the piece of skin was to be closed as completely as possible by sticking plaister, that it might heal with a small scar.[20]

Professor Jüngken twice adopted this method, in cases of ectropium of the lower eyelid; but in both cases it failed entirely.[21] Some such method appears, however, to have succeeded in the hands of Dr. Fricke of Hamburgh.[22]

In later years, the operation has been frequently performed, both on the upper and on the lower lid. In general, it is performed without twisting the flap, as in the following case:—

Case 155.—Maria Connell, aged 14, was admitted under my care at the Glasgow Eye Infirmary, 10th Aug. 1843. When about 16 months old, she received an injury by a gate falling upon her, in consequence of which an abscess formed in the left upper eyelid, and, bursting through the skin, discharged matter for many months. This was followed by ectropium, to such an extent, that, when the eyes are open, a large portion of the conjunctiva is exposed, and the cilia tilted up so as to be in contact with the eyebrow. (*Fig.* 22.) The ectropium is increased when the patient attempts to close the eye. There is a very great deficiency of skin in the everted eyelid, and it feels as if bound by a band to the inner surface of the orbit. The upper part of the left cornea is hazy, and vision of that eye so imperfect that she with difficulty distinguishes with it one finger from another. She keeps the eye constantly covered, to hide the deformity.

The everted eyelid was divided transversely in the seat of the cicatrix, and the edges dissected so as to dilate the wound (*Fig.* 23, *a*, *b*), and allow the lid to resume its natural situation. A piece of pasteboard was laid on the temple, and the flap (*b*, *c*) was insulated with the scalpel, of the exact size and shape of the piece of pasteboard. The anterior edge of the flap was continued into the wound. The flap was now dissected off, except at its basis (*b*), turned round into the wound of the eyelid (*b a*), and connected with its edges by stitches. The edges of the wound on the temple were brought together by stitches. A considerable degree of ectropium still remained. Both eyes were covered with spread pledgets, and a double-headed roller applied from the hind-head forwards.

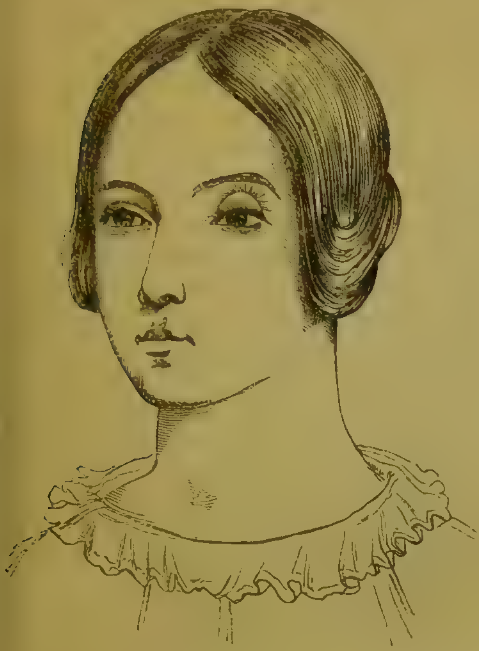

Fig. 22.

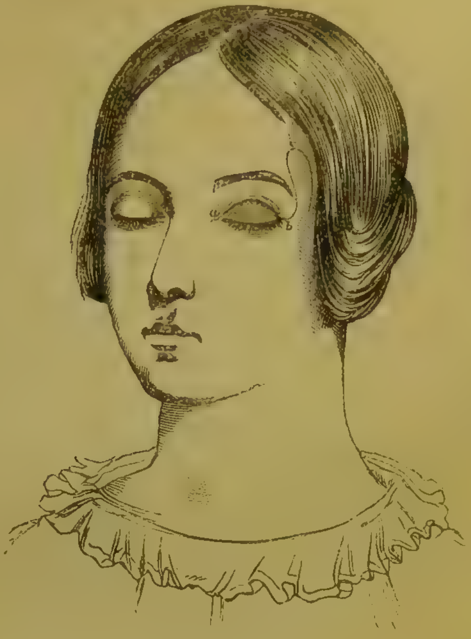

Fig. 23.

13th, The external dressings were removed. There is little or no swelling about the parts that were cut, and she makes no complaint of pain. The lid appears more in its natural place than it did immediately after the operation, owing probably to the support of the dressings and bandage.

14th, Three of the stitches removed.

15th, Six more of the stitches removed, being all those which served to keep the flap in its new situation. Two stitches remain in the wound on the temple, which appears quite united. There is considerable motion in the new eyelid. Stripes of court-plaister were applied in place of the stitches along the lid, and another stripe across both upper and lower lids. Compresses and a roller were applied over both eyes.

16th, All the stitches removed, as well as a ligature which was applied on one of the branches of the temporal artery. Two stripes of court-plaister applied across the left eyelids, and both eyes covered with a compress and roller.

21st, All the dressings omitted.

24th, On closing the eyes, without making any particular effort to do so, the left lids do not come together, but leave an interstice between their edges of about $\frac{1}{10}$ inch in breadth; but on making an effort to close the eyes, the edges of the left lids come together perfectly. On looking straight forwards, the left lids are open almost exactly to the same extent as those of the right eye, but the eyeball is a very little directed more downwards than the right. This seems the effect of aving long retained the eye in that position previously to the operation. The icatrice by which the upper edge of the flap is united to the eyelid forms a depression exactly in the situation of the natural sulcus, formed by the action of the evator muscle. The lower edge of the flap is united without any evident cicatrice. he line by which the edges of the wound on the temple is united is scarcely disinguishable; and it would be impossible to discover, by mere inspection, that at *b* ny turn or change of place had been given to the flap. Not the slightest eversion emains.

From the very great deficiency of integument in the everted eyeid, there could be no hesitation as to the choice of an operation in his case. It was evident that a transplantation of skin only could emedy the deformity. Suppose that the tarsus had been drawn lown into its natural position by an incision of the cicatrice, and an attempt made, according to Chelius' plan, to keep the edges of the wound apart till it granulated and cicatrized, months would have elapsed ere this could have been accomplished, and even after cicatrization was finished, the granulations would have been apt to be absorbed, and the eversion to return ; an event completely prevented by the blepharoplastic plan.

It does not do to trust to the eye, in estimating the size of the flap which is to be insulated and detached. An exact measure of the wound, made in dividing the cicatrice and replacing the lid, must be transferred to the piece of pasteboard. Owing, however, to the contraction which the skin suffers, both in breadth and length, as soon as it is raised from its natural place, the flap requires to be somewhat broader and longer than the wound into which it is to be received. Fricke says it should be one line broader and longer, but this would scarcely be sufficient. At the same time, by applying numerous stitches as close as possible to the edges of the wound and of the flap, the latter may be extended considerably after it is adjusted to its new situation, and by employing pretty thick compresses and a double-headed roller, it may be prevented from shrinking so much as it would otherwise do.

Some operators would dissuade us from bringing the edges of the wound left by displacing the flap, together by suture, lest the doing so should drag too much on the flap, and cause the stitches by which it is fixed to give way. They would allow it to heal by granulation.

When a blepharoplastic operation is to be performed, the thickened conjunctiva should be left untouched, and no part of the skin, neither sound, nor hardened and contracted by previous cicatrization, nor any portion of the cellular substance, should in general be removed. The incision of the lids should pass through the middle of the cicatrice. The transplantation should then be accomplished ; and when the incisions are healed, it will rarely be found necessary to interfere with the conjunctiva, or to shorten the lid transversely by the extirpation of any part of it.

When the operation of restoring a lower lid is attempted, the flap has sometimes been taken from the cheek; but it appears to answer fully better to take it from the temple, as was done by Dr. Brainard, in a case related[23] by him, and of which *Fig.* 24. shows the situation whence the flap was taken, and the adaptation of it by sutures to supply the place of the defective lid.

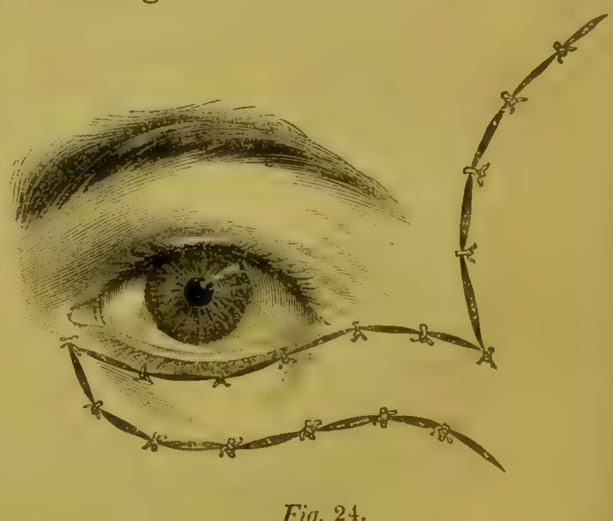

Fig. 24.

One of the chief dangers attendant on such blepharoplastic operations is gangrene of the transplanted flap. This may arise from the basis by which it retains part of its natural connections being too narrow, from its not being kept closely in contact with the wound to which it is transferred, or, on the other hand, from being too much pressed against the bones by the compress and roller.

Another untoward event is the flap not continuing to lie flat and in contact with the wound, but curling gradually up into a globular mass, so that, as Dieffenbach says, it looks more like the point of the nose than an eyelid.

The success of a blepharoplastic operation depends much on the state of the integuments, whence the flap is to be taken. The prospect is good, if the skin to be transplanted is healthy. In this state it is very extensible, so that it may be transferred from its natural place to a degree that it is scarcely conceivable. But if the skin to be transplanted is changed in structure from inflammation and cicatrization, the chance of success is much reduced.

§ 4. *Eversion from Caries of the Orbit.*

Syn.— Ectropium symptomaticum.

Fig. Dalrymple, Pl. II. *fig.* 3.

I have already had occasion to refer (pages 32 and 38) to the great degree of shortening of the lid, with which eversion from caries of the orbit is generally attended, and to a circumstance which we may remark more or less in every variety of this disease, but which is often very strikingly displayed in those cases where the upper lid is dragged up under the edge of the orbit, from an affection of the bone, namely, the degree of accommodation of the lower lid to the deficient state of the upper.

Cases such as those represented in *Figs.* 1, 2, and 3 (page 32), may often be relieved by one or other of the operations recommended for the third variety of eversion, and particularly by those compound ones in which the morbid adhesions are separated, the eyelid and neighbouring integuments extended, the thickened conjunctiva removed, and a wedged-shaped portion of the eyelid cut out.

If the distortion, however, is slight, it ought not to be meddled with, or merely a fold of conjunctiva ought to be extirpated, without interfering with the skin, or attempting to detach the cicatrice. When the distortion is very great, we may be led to attempt a blepharoplastic operation.

Dr. Ammon, in a case of eversion, with adhesion of the cicatrice to the outer surface of the edge of the orbit, surrounded the deeply depressed cicatrice by an incision, left it adherent to the bone, detached the neighbouring integuments all round to such an extent that the lid was set at liberty, and the patient could shut the eye, and then closed the external wound over the old cicatrice. The lid was in this way elongated, a scarcely observable scar ensued, and the disagreeable depression at the edge of the orbit was no longer in view.[24]

By a still simpler operation, Mr. Wilde relieved a similar case, of which he gives a figure, not materially different from *Fig.* 1. p. 32: —

Case 156.—The parts above and below the cicatrice being made as tense as possible, Mr. Wilde introduced a small narrow-bladed and double-edged knife, at the distance of nearly an inch on the outer side of the cicatrice, passed it obliquely down to the bone, and under the cicatrice, and moving it in a semicircular manner from above downwards, and at the same time pushing it forwards, he detached the entire adhesion, and nearly an inch on each side of it, fully from the bone. As soon as it was found perfectly free, and that the lid could be restored to its normal position, the knife was withdrawn, and the small wound closed with adhesive plaister. The effusion of blood which immediately took place beneath the cicatrice, caused a tumour where the depressions had existed, and care was taken that none of this blood escaped through the external wound. A ligature was then passed through the lower lid, about ¼ inch from its ciliary margin, and the ends of it drawn up and attached to the forehead during the next three days. Cold applications were applied, and Mr. W. had the satisfaction to find that, within a fortnight afterwards, the deformity was completely removed, the depression of the cheek filled up, and the lid restored to its natural position.[25]

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[1] Practical Treatise on the Diseases of the Eye, p. 228; London, 1820.

[2] See Guthrie's Lectures on the Operative Surgery of the Eye, p. 61; London, 1823.

[3] Staub de Blepharoplastice, p. 79; Berolini, 1835.

[4] Pathologie Chirurgicale, p. 136; Pl. x. Fig. 17; Paris, 1831.

[5] De Re Medica; Lib. vii. Pars ii. Cap. i. Sect. 2.

[6] Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 170; 12mo; Paris, 1774.

[7] See case by Reil, in which extirpation of conjunctiva was first tried, and failed; but a cure afterwards effected by incision of the lid. Duncans' Annals of Medicine; Vol. i p. 159; Edinburgh, 1796.

[8] See case by Curling, Medical Gazette; Vol. xxviii. p. 17; London, 1814.

[9] Zeitschrift für die Ophthalmologie; Vol. i. p. 47; Dresden, 1830.

[10] Medical Gazette; Vol. xviii. p. 224; London, 1836.

[11] Practical Observations on Ectropium, &c.; London, 1814. To Sir William Adams belongs the merit of the operation described in the text. The reader, however, who has at all turned his attention to the history of this part of surgery, will at once trace the resemblance of Sir William's operation to that practised by Antyllus, some 14 or 15 centuries before. The incision practised by Antyllus, having the form of the Greek letter Λ, implicated only the structures on the inside of the lid, leaving the skin undivided. The lips of the wound were drawn together by a suture. Aetii Contractæ ex Veteribus Medicinæ Tetrabiblos; Tetrabib. II. Sermo iii. cap. 72. p. 359; Basileæ, 1549.

[12] Bericht über das clinische chirurgisch-augenärztliche Institut der Universität zu Berlin, für 1829 und 1830, p. 9; Berlin, 1831.

[13] Dreyer, Nova Blepharoplastices Methodus, p. 40; Vindobonæ, 1831: Brown, London Medical Gazette; Vol xvii. p. 721; and Vol. xviii. p. 485.

[14] Mémoires de l'Académie Royale de Chirurgie; Tome ii. p. 343; 12mo; Paris, 1780.

[15] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. ix. p. 86; Berlin, 1826.

[16] Review of Zeis' Handbuch der plastichen Chirurgie, in British and Foreign Medical Review, for April, 1839, p. 406.

[17] Ibid.

[18] Ammon's Zeitschrift für die Ophthalmologie; Vol. iv. p. 428; Heidelberg, 1835: Staub. Op. cit. p. 98: Chelius, Handbuch der Augenheilkunde; Vol. ii. p. 166; Stuttgart, 1839.

[19] Zeitschrift für die Ophthalmologie; Vol. v. p. 313; Heidelberg, 1836

[20] Lehre von den Augenoperationen, p. 267; Berlin, 1829.

[21] Ibid. p. 9.

[22] Die Bildung neuer Augenlider; Hamburg, 1829. Delpech has published an interesting case of restoration of part of the lower eyelid, and side of the nose, by an autoplastic operation, in his Chirurgie Clinique de Montpellier; Tome ii. pp. 221, 253; Paris, 1828. See case by Horner, American Journal of the Medical Sciences; Vol. xxi. p. 105; Philadelphia, 1837.

[23] American Journal of the Medical Sciences, for October, 1845, p. 356.

[24] Zeitschrift für die Ophthalmologie; Vol. i. p. 49; Dresden, 1831.

[25] Dublin Quarterly Journal of Medical Science, for May, 1848, p. 473.

SECTION XXXIV. — TRICHIASIS AND DISTICHIASIS.

Τριχίασις, from ϑρὶξ, *hair*. Distichiasis, from δίστιχος, *having two rows*.

Fig. Ammon, Zweiter Theil. Tab. IV. *figs*. 9, 10. Dalrymple, Pl. II. *fig*. 4.

Trichiasis is an inversion of the eyelashes; distichiasis means a double row of eyelashes, the inner row, or *pseudo-cilia*, as they are termed, being turned in upon the eyeball. The fact is, however, that what are called pseudo-cilia in distichiasis, although they issue from the skin at a wrong place, and grow in a wrong direction, are seldom, if ever, new or supernumerary productions, but merely natural cilia, the bulbs of which have been displaced by pressure or by disease, affecting the border of the eyelid.

Symptoms. We very seldom find all the eyelashes turned towards the eyeball, except when the trichiasis is merely a symptom of inversion of the edge of the eyelid, a disease which we leave out of view for the present, and even when it is a symptom of inversion of the edge of the eyelid, the trichiasis is often partial. In the same manner, the displaced cilia in distichiasis (*Fig*. 25.) seldom occupy the whole length of the eyelid; but in most cases are strewed here and there in parcels, between the natural cilia and the Meibomian apertures, but generally nearer to the latter. In some instances, we find the outer margin of the lid rounded off, and the whole space between it and the Meibomian apertures covered with cilia.

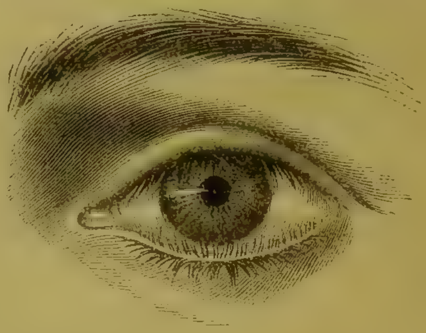

Fig. 25.

When only one or two small colourless eyelashes are inverted, they are apt to escape being noticed, and the diseased appearances of the eye, which are owing to their irritation, are supposed to be occasioned by some disorder of the eyeball itself. Means are even directed against the effects while the cause is overlooked, and the eye may be seriously injured, and even vision lost, from a derangement so minute that it is apt to pass unobserved. In every case in which recovery from an attack of ophthalmia proceeds with more than ordinary slowness, the surface of the cornea continuing dim, and strewed with blood-vessels, the eye discharging tears upon the smallest increase of light, and the patient complaining of the sensation of a foreign body rubbing against the eye, we ought carefully to examine the edges of the eyelids, and discover whether any of the eyelashes be inverted. In distichiasis especially, the displaced eyelashes are in general so soft, short, and light-coloured, that they can be seen only when the eyelids are opened wide, but at the same time allowed to remain in contact with the eyeball. The moment that the edge of the lid is drawn forwards from touching the eyeball, the displaced cilia are scarcely or not at all visible. On again applying the edge of the lid to the eyeball, so that the iris, or the pupil, forms a contrasting back-ground to them, the cilia return into view. Condensing the light upon them by means of a convex lens, assists in rendering them visible.

Trichiasis and distichiasis affect the upper, much oftener than the lower eyelid. This may, perhaps, depend on the natural disposition of the borders of the two eyelids; the border of the upper being directed downwards and inwards, while that of the lower is turned upwards and outwards.

Causes. Trichiasis and distichiasis are in an especial manner the consequences of neglected catarrhal ophthalmia, scrofulous ophthalmia, and ophthalmia tarsi. Small-pox was formerly a very abundant source of these derangements of the cilia. Burns of the conjunctiva and edge of the lid, and every affection attended with abscesses and ulcers at the roots of the eyelashes, are apt to give rise to trichiasis and distichiasis, especially if the patient is allowed to lie much on the face, so that the cilia, loaded with mucus, or matted together by the diseased secretion of the Meibomian follicles, are forced in a constant direction towards the eyeball. I have seen a swollen state of the upper lid from syphilitic inflammation, cause by pressure trichiasis of the lower lid.

The exciting causes of trichiasis, such as those now enumerated, produces, as Mr. Wilde has pointed out[1], an unhealthy deposit in the interspaces between the roots of the cilia, along with a contracted state of the conjunctiva, which may be regarded as the proximate cause.

Palliative cure. Evulsion. The palliative cure of trichiasis and distichiasis consists in removing one after the other, all the inverted and misplaced cilia, by means of a proper pair of forceps. (*Fig.* 26.)

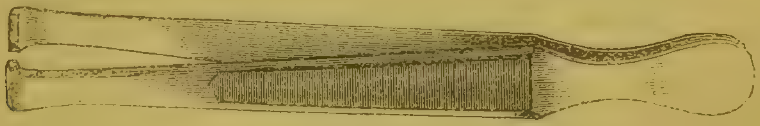

Fig. 26.

The best cilia-forceps are those without teeth; the surfaces which meet, to lay hold of the hair, being merely roughened. Each eyelash is to be laid hold of as close as possible to the skin, and pulled out in a straight direction, in order that it may not break. Except when the edge of the lid is perfect, and the trichiasis entirely the result of the cilia having been matted together by mucus, this operation must be regarded as calculated to afford merely temporary relief. Carefully and frequently repeated, it occasionally proves, even in cases of distichiasis, especially in young subjects, a radical means of cure; but on this we cannot depend, and, therefore, as soon as the inverted or displaced cilia re-appear, they must again be extracted. We meet with patients who for many years have been obliged, every eight days or oftener, to have this repeated.

Radical cure. The constant repetition even of the trifling operation of evulsion being found by many extremely annoying, we are often asked whether there is no means by which trichiasis or distichiasis can be permanently removed. With this view, the following plans have been had recourse to:—

1. *Restoring to the cilia their natural direction.* The practice of turning the distorted hairs into their proper direction, and cementing them to the other cilia, or to the skin, is not altogether to be despised. When the distorted hairs in trichiasis are long, by keeping them for a fortnight or three weeks in their natural direction, a cure may sometimes be effected. For this purpose, collodion may be used, or strong shell-lac varnish. A little of one or other of these fluids, taken up on the point of a bit of wood, is to be applied to the distorted hairs, and those beside them, so as to mat them together, and bind them down to the skin. The parts must be examined daily, and retouched, if the crust formed by the drying of the collodion, or the varnish, has any where given way.[2] This practice will be of no service in distichiasis.

2. *Extirpation of a fold of skin.* In cases of trichiasis, in which for a considerable space along the edge of either lid, the eyelashes, instead of standing out horizontally with their natural curve, are directed perpendicularly, so as to cling to the surface of the eyeball, and this without any irregularity or disorganization of the edge of the lid, we generally find that by laying hold of a transverse fold of the skin of the lid, the eyelashes assume their proper direction. Estimating, then, the quantity of skin necessary to produce this effect, we lay hold of it with the entropium forceps (*Fig.* 16, p. 187), clip it out with a stroke or two of the scissors, and bring the edges of the wound together with two or three stitches.

3. *Cauterization of the skin.* The same thing may be effected by cauterization, actual or potential. A smooth horn spatula (*Fig.* 27.), convex on the one side, and concave on the other, and grooved transversely on its convex side, a little way from its extremity A, is to be passed between the eyeball and lid, in such a way that the edge of the lid shall rest in the transverse groove, and the lid be put on the stretch by pressing the spatula a little forwards. A small flat cautery, about the twentieth of an inch in thickness, raised to a white heat, is then to be drawn along the skin of the lid, parallel to the eyelashes, and at the distance of about the twentieth of an inch from them. The same cauterization may be effected by a pencil of pure potash, pointed by dipping the end of it in water. When the eschar separates, a slight ectropium will result from the contraction of the cicatrice, and the eyelashes will resume their natural direction.[3]

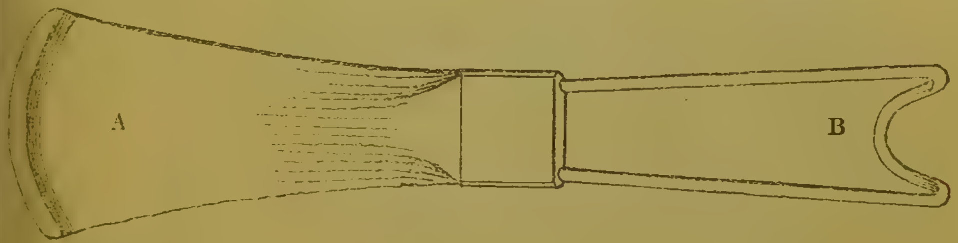

Fig. 27.

The direction of single inverted hairs may be corrected, by running the point of a lancet into the edge of the lid immediately to the outside of the root of the hair, and inserting into this little wound a speck of pure potash, thus producing a small ulcer, which in cicatrizing alters the direction of the hair.

4. *Destruction of the bulbs by inflammation.* The effect of inflammation in destroying the ciliary bulbs, or hair capsules, as exemplified in ophthalmia tarsi, small-pox, &c., which sometimes leave the lids affected with partial madarosis, or baldness, has suggested the plan of exciting artificially such inflammation in these secreting organs of the cilia, as shall be sufficient to destroy them, or at least render them incapable of continuing their function. Celsus, and even modern surgeons, have used the actual cautery for this purpose; but generally inoculation with some irritant has been preferred, such, for instance, as the tartrate of antimony.

The parts being put on the stretch by means of a small hook, or over the horn spatula, the bulb is to be punctured with a lancet, or an iris-knife, which should be entered close to the base of the inverted cilium, in the direction of its growth, to the depth of $\frac{1}{8}$ inch, and moved about a little, so as to widen the bottom of the wound, and cut the bulb. The bleeding having wholly ceased, and the lid being wiped quite dry, the inoculation is to be effected with the point of a small probe, or the drilled end of a darning-needle, slightly damped, and dipped in powdered tartrate of antimony, inserted into the puncture, and held there for a few seconds; or the same may be done with a bit of platinum foil, shaped like a lancet, heated, covered with a very thin coating of sealing-wax, and pushed, while hot, into powdered tartar emetic. The eyelash is now to be seized close to its root, and extracted. Bulb after bulb is to be treated in this way. The inflammation which immediately follows, generally subsides in twenty-four hours; but if the operation has been properly performed, it recurs in a day or two, with the formation of small pustules, and though of very limited extent, is sufficient to destroy the functions of the bulbs.

Dr. James Hunter, to whom we are indebted for this plan of curing trichiasis and distichiasis, tried alcohol, nitric acid, aqua ammoniæ, capsicum, euphorbium, and croton oil, for inoculating the bulbs; but these substances were ineffectual.[4]

5. *Excision of the edge of the eyelid.* Some operators have contented themselves, in cases of trichiasis, with the simple plan of paring away the edge of the eyelid, removing in this way that part of the lid whence the cilia grow, as well as the Meibomian apertures.[5] I remember seeing a Jew girl in Vienna, who had been operated on in this manner, by Dr. C. Jäger. The pain and inflammation of the eye, and the opacity of the cornea, caused by the inverted lashes, were of course removed, and the deformity, produced by this curtailment of the lids, was very trifling. A perpetual tendency to lippitudo, however, must follow the obliteration of the Meibomian canals.

Dr. Jacob performs essentially the same operation, in the following manner:—He passes the point of a fine hook beneath the lid, and draws the hook towards him till its point shows through the skin, at a distance of about a line from the external angle of the eye. He, then, with common straight scissors, cuts into the lid between the point hooked and the external angle of the eye, continuing the incision by repeated clips along the lid, and at a distance of something more than a line from the margin, until he comes to the punctum. In fact, he clips away the ciliary margin of the eyelid from the external angle to the punctum, including skin, cartilage, and roots of the cilia, not leaving any notch at either end, but sloping the incision as he cuts in at the external angle and out at the punctum, thus obtaining a regular edge, and leaving a portion of the cartilage sufficient to preserve the form and motions of the lid.[6]

6. *Extirpation of a stripe of the integuments, including the bulbs of the cilia.* The operation proposed by Prosessor Jäger[7], for the cure of trichiasis, is one of the most efficient. It differs both from Mr. Saunders' extirpation of the cartilage, and from the paring of the edge of the lid just mentioned. It consists in removing that portion of the integuments under which lie the bulbs of the cilia, leaving the cartilage, and, as far as possible, the Meibomian apertures, entire. The bulbs of the cilia must be removed, the lacrymal canals and puncta being preserved; if the trichiasis is only partial, then the operation is to be limited to the part where the eyelashes have a wrong direction.

The horn spatula (*Fig.* 27.) being introduced beneath the eyelid, and the skin put on the stretch, the skin, and orbicularis are divided, with a small scalpel, by a transverse incision, parallel to, and fully a line from, the diseased cilia: the spatula is now withdrawn, the ciliary edge of the wound laid hold of, at its temporal extremity, with a pair of toothed forceps[8] (*Fig.* 28.), and by repeated strokes of the knife, the outer margin of the lid, along with some of the fibres of the orbicularis, and the whole bulbs of the cilia, is dissected off in a stripe. Dr. Jäger leaves the wound to cicatrize; Mr. Wilde brings its edges together with fine sutures.

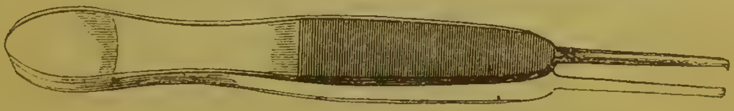

Fig. 28.

If any of the bulbs of the cilia have escaped extirpation, they appear like black points in the wound, about the third or fourth day after the operation. Caustic should immediately be applied to them, so that they may be destroyed.

7. *Excision or destruction of the bulbs of the cilia.* The following operation is recommended[9] by Vaccà Berlinghieri, of Pisa: —

The surgeon having ascertained the number of inverted eyelashes, and the extent which they occupy, with pen and ink traces a line on the skin, parallel to the margin of the eyelid, and at the distance of a quarter of a line from it. The line, drawn with the pen, should show upon the external surface of the eyelid the exact space occupied towards its internal surface by the distorted cilia. The horn spatula (*Fig.* 27.) is now to be introduced between the lid and the globe of the eye, so that the edge of the lid is placed on the grooved part of the convex surface of the spatula. With one hand, the assistant holds the spatula, while, with the index and mid finger of the other hand, he keeps the lid fixed and on the stretch. The surgeon now makes two small vertical incisions through the integuments, with the scalpel, commencing a line and a half from the edge of the eyelid, and terminating exactly at its edge. These two incisions inclose the space on which the line was marked with ink. A transverse incision, parallel to the line so marked, is now to unite the two vertical incisions. The flap, circumscribed by these three incisions, is to be raised from the subjacent parts, so as to bring the bulbs of the cilia into view. It is not, however, always easy to see and extirpate them, partly from the blood which conceals them, partly from the dense tissue which surrounds them and renders it difficult to lay hold of them. The surgeon, therefore, must cleanse the wound well from blood, and be provided with a good pair of fine forceps, with which, and a small scalpel, or scissors, he may remove all that lies between the everted flap and the external surface of the tarsus. That being done, the operation is finished. The flap is replaced in its natural position, and kept so by a strip of court plaister.

Having repeatedly performed this operation, I conceive a transverse incision, about a line from the margin of the lid, to be sufficient, without the two vertical ones. The incision gapes sufficiently to allow us to go on with the extirpation of the bulbs, without dissecting back any flap. The cellular tissue, surrounding the bulbs, however, is too dense to permit of being seized with forceps. I use, therefore, a small sharp hook, which I pass beneath the spot where I conceive the bulbs to lie, and raising the part seized with the hook, I snip it out with scissors. I then seize another and another bit, till I think I have accomplished the extirpation of all the faulty bulbs. If I have doubts about any of them, I touch the part with a pointed piece of potassa fusa. Next day the wound is healed, without any dressing.

If the inverted cilia are placed at a considerable distance from one another, and in the interval between them there are cilia growing naturally, Vaccà directs us to attack particularly the bulbs belonging to the distorted cilia, and not to uncover nor destroy the roots of the natural ones.

He confesses that the extirpation of the bulbs, in the manner described, might puzzle one not accustomed to perform delicate operations. He tried, therefore, the plan of raising the flap as before, and destroying the bulbs with nitric acid. This may be better applied by means of a bit of wood, than by the contrivance used by Vaccà.

The cilia, of which the bulbs have been dissected out, or destroyed, would come away, about the sixth day after the operation; but it is better to pull them out immediately.

I have repeatedly assisted my colleague Dr. Rainy, while he performed the following operation for trichiasis or distichiasis:—

Everting the eyelid, and laying hold of it with a pair of forceps, he made an incision, with an extraction-knife, close and parallel to the inner edge of the border of the lid, and then another between the natural row of cilia and the inverted or displaced ones. He then extirpated the piece of the lid intervening between these two incisions, including the morbid cilia and their bulbs. It is difficult to make the incisions deep enough, owing to the firmness of the cartilage and other textures.

8. *Excision of a wedge-shaped portion of the lid.* When four or five eyelashes, in a bundle, turn in upon the eye, we may cut out a triangular or narrow wedge-shaped piece of the whole thickness of the lid, including the faulty eyelashes, and bring the edges of the wound together by stitches, as in the operation recommended by Sir W. Adams for the cure of eversion.

False eyelashes are sometimes met with, growing from different parts of the conjunctiva, even from the conjunctiva corneæ. Dr. Monteath mentions[10] a case, in which one exceedingly strong hair grew from the inner surface of the lower lid. It was directed perpendicularly towards the eyeball, and irritated it. The natural cilia were of a light colour, the pseudo-cilium jet black, and double the strength of the common cilia.

I once met with an eyelash fully an inch in length, soft, and woolly, in a patient who had long suffered from ophthalmia.

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[1] Dublin Journal of Medical Science for March, 1844, pp. 105, 109.

[2] Jacob, in Dublin Hospital Reports; Vol. v. p. 394; Dublin, 1830.

[3] Chirurgie Clinique de Montpellier, par Delpech; Tome ii. p. 295; Paris, 1828.

[4] Edinburgh Monthly Journal of Medical Science; Vol. i. p. 259; Edinburgh, 1849.

[5] Heisteri Institutiones Chirurgicæ; Vol. i. p. 514; Amstelædami, 1750: Schreger, Chirurgische Versuche; Vol. ii. p. 253; Nürnberg, 1818.

[6] Jacob, Op. Cit. p. 391.

[7] Hosp, Dissertatio sistens Diagnosin et Curam Radicalem Trichiasis, Distichiasis, nec non Entropii; Viennæ; contained in Radius's Scriptores Ophthalmologici Minores; Vol. i. p. 199; Lipsiæ, 1826.

[8] The toothed forceps, figured in the text, have at the end of the one blade a tooth, which is received into an interstice at the end of the opposite blade. When shut, the instrument appears like a small probe. It differs, therefore, from Blömer's forceps, which has two teeth projecting from the one blade, and one from the other.

[9] Nuovo Metodo di curare la Trichiasis; Pisa, 1825.

[10] Translation of Weller's Manual; Vol. i. p. 115; Glasgow, 1821.

SECTION XXXV. — ENTROPIUM, OR INVERSION OF THE EYELIDS.

Entropium, from ἐν, *in*, and τρέπω, *I turn*.

Fig. Wardrop, Vol. I. Pl. VII. *figs.* 2, 1. Dalrymple, Pl. II. *fig.* 5., Pl. III. *fig.* 1.

Exclusive of *traumatic* entropium, there are two varieties of this disease, which differ materially in their causes, symptoms, and modes of cure. The one is *acute* or *spasmodic*, the other *chronic* or *inflammatory*. The first is attended with little organic change of the affected lid, the second with much; the first is most frequently met with in old persons, the second in young; the first in healthy, the second in scrofulous subjects; the acute is a disease chiefly of the tegumentary, the chronic chiefly of the conjunctival surface of the lids.

1. The *acute* variety not unfrequently takes its origin in an attack

of ophthalmia, during which the patient kept the eyelids long shut, perhaps covered with a poultice, or pressed inwards by a bandage. I have repeatedly seen it take place during the after-treatment of extraction of the cataract. The lower lid is almost exclusively the seat of this variety of inversion. The skin of the inverted lid is generally swollen and puffy. Its edge is perfectly regular in form, not thickened nor indurated, but entirely rolled back towards the eyeball, so that the eyelashes are fairly out of sight (*Fig.* 29.), lying between the eyeball and the internal surface of the eyelid. On applying the finger to the outer surface of the lid, and drawing it a little downwards, the eyelashes start into view, clinging to the surface of the eyeball; a little more traction rolls the edge of the lid completely into its natural place, and there is no appearance of trichiasis. The conjunctiva is nowise contracted, the lid nowise shortened, the cartilage nowise changed in structure. If we cease making pressure on the lid, it remains for a minute or two in its proper position, and then, with a sudden jerk, becomes inverted as before.

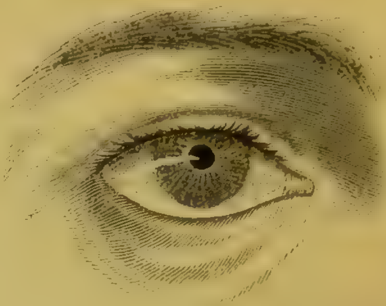
Fig. 29.

This kind of inversion appears to be owing partly to the relaxed state of the integuments, partly to an irregular action of the orbicularis palpebrarum. The circumferential part of the muscle seems to have lost its wonted power of supporting the body of the lid, while its ciliary portion, acting inordinately, rolls the edge of the lid into the inverted position. We meet with this variety of entropium almost exclusively in elderly persons, in whom the skin has already lost its natural contractility, so that it falls into folds, particularly about the eyelids. A superabundant state of the skin evidently favours the disease.

The eyeball is much irritated by the eyelashes rubbing against it in the act of winking, and hence the patient keeps the eye shut, and as much as possible at rest. He even squeezes the lids so much together, as to bring the skin of the upper and lower lids into contact. The eye waters much, and the tears fret and excoriate the skin of both lids. The cornea inflames, and in consequence of neglect may become totally opaque.

This variety of inversion is an occasional attendant on catarrho-rheumatic or arthritic ophthalmia, along with severe circumorbital pain, and sometimes with ulceration of the cornea. In such cases, not only must the entropium be removed, but at the same time venesection, calomel with opium, and other remedies must be used, to cure the ophthalmia. We occasionally meet with this variety in children, along with scrofulous ophthalmia.

2. The *chronic* variety of inversion is the result of long-continued ophthalmia tarsi, or neglected catarrhal conjunctivitis. The upper lid is as liable to be affected as the lower, and often both are inverted at the same time. The edge of the affected lid is thickened,

irregular and notched, and shortened from canthus to canthus, so that it presses unnaturally on the eyeball.[1] The cartilage is indurated, as well as inverted. The sinuses of the conjunctiva are contracted, and its surface more or less dry and cuticular. No degree of traction which we employ, is sufficient to roll the lid into its natural situation; we may drag it from the eyeball, and bring the cilia into view, but still the edge of the lid continues inverted. (*Fig.* 30.) The cilia are generally few in number, dwarfish, and themselves affected with inversion, independently of the state of the lid, so that there is a combination of trichiasis with entropium. Notwithstanding their being few and small, the cilia are sufficient to keep up constant suffering, and by the irritation which they occasion, to render the cornea vascular and nebulous. The pain they induce by rubbing against the eye, deprives the patient of the enjoyment of sight; he keeps his eyes constantly shut, and avoids every thing which would produce motion of the lids or of the globe of the eye. At length, the cornea becomes quite opaque, and its conjunctival layer acquires a degree of morbid thickness and insensibility, which renders the pain attending the disease less distressing. Long previously to this, however, the whole conjunctiva has, in general, lost its secretive power, and become affected with xeroma.

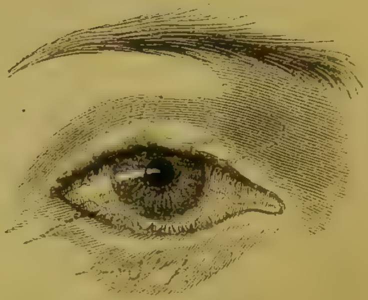

Fig. 30.

Irregular action of the orbicularis palpebrarum may also have to do with the production of this kind of inversion, but it is evident that the structure of the lid is here much more impaired. Inflammation has altered the glandular organs, the conjunctiva, the perichondrium, and even the cartilage itself. Repeated ulcerations have destroyed the form of the edge of the lid, notched it with cicatrices, and permanently fixed it in the state of contraction and inversion.

3. *Traumatic* entropium is generally the result of a scald or burn of the conjunctiva, or of the intrusion of some caustic substance, as quicklime, into the sinuses of the eyelids. It is often conjoined with a degree of symblepharon, and sometimes the cartilage has been partially destroyed by the injury.

Prognosis. This is favourable in the acute variety, as it is always curable, by proper applications, or by operation. Sometimes the disease returns; only a temporary cure in either of these ways having been effected. In the chronic variety, the prognosis is much less favourable. Relief to the pain, and other urgent symptoms, may be obtained from operation, but the lids are apt to remain shrunk, the conjunctiva atrophied, and the cornea diseased. The prognosis in traumatic cases is very variable.

Treatment. 1. The treatment of the *traumatic* variety will depend on the degree of the disease; in slight cases, the operation about to be described as suitable for acute inversion will be sufficient; in worse cases, a similar plan of cure as that pursued in chronic inversion, may be necessary. As the one of these two kinds or degrees of inversion is much less complicated in its symptoms than the other, so is the method of cure for the one simple, for the other complex.

Case 157. — In consequence of a wound of the upper lid with some sharp instrument, and the wound neglected, in a man who put himself under my care, the nasal half of the lid was inverted, and the patient sadly tormented by the irritation of the eyelashes. They were so much inverted, as to be fairly on the inside of the portion of the lid to which they belonged. I made a vertical incision with a pair of scissors through the lid, where the nasal and temporal halves met, intending to snip out a fold of the skin, and then bring the edges accurately together by the interrupted suture. I found, however, that it would be unnecessary to remove any portion of the skin. As soon as the vertical incision of the lid was made, the nasal portion came itself into its place, so that I had merely to bring the edges of the incision together with two stitches.

2. In every case of inversion, acute or chronic, it is proper to endeavour to remove the conjunctival or the tarsal inflammation, in which the misplacement of the lids has originated. This is greatly promoted, in most cases, by cleanliness, fresh air, and proper attention to diet. The ophthalmia must be treated with the remedies which its peculiar nature demands; and on this point the reader may consult the sections on ophthalmia tarsi, catarrhal, catarrho-rheumatic, and scrofulous ophthalmiæ. We meet with many cases, in which an operation for entropium is the only means which can remove the ophthalmia, and save the eye.

3. *Acute* entropium sometimes, but, it must be confessed, very rarely, subsides under antiphlogistic means, aided by such mechanical contrivances as keep the lid in its natural place. For this purpose, strips of adhesive plaister used to be applied so as to cross each other upon the middle of the lid; or a small pad, sewed upon a piece of tape, was made to press upon the lid, the tape passing over the nose, and under the ears, crossing on the occiput, and tying on the forehead. These means are now supplanted by collodion.[2] The lid being held in its natural position, the whole of its external surface is to be painted, by means of a smooth piece of stick, with collodion. This, drying instantly, keeps the lid from re-assuming the state of inversion. The application must be renewed every two or three days, and sometimes it proves a radical cure. Before I read Mr. Bowman's paper on the subject, I covered the collodion with a bit of cloth, but this I have laid aside.

In acute inversion, when we take hold of a transverse fold of the skin of the inverted lid, the displacement is for the time removed, and the patient can open and shut the eye without difficulty, and without any return of the inversion. Having laid hold, then, of the fold of skin with a pair of broad convex-lipped forceps (*Fig.* 13. p. 180), remove it with the scissors, bring the edges of the wound together by two stitches, and as soon as union is completed, the inversion will be found to be cured.

So much skin as is sufficient to overcome the inversion, and neither more nor less, is to be removed. After laying hold of the fold with the forceps, the surgeon must observe whether the cilia appear in their natural place, and have their proper direction. If they still incline inwards, the fold is too little, and more of the skin must be laid hold of; if the cilia not only incline outwards, but the conjunctiva is brought into view, the fold is too broad, and less skin must be grasped with the instrument. In old people, it is sometimes necessary to remove a very broad piece of skin. Care must always be taken to leave sufficient integument between the cilia and the edge of the wound, for the insertion of the stitches.

If this variety of inversion has lasted a considerable time, and in addition to the mere displacement of the lid, consequent to the redundant state of the skin, and irregular action of the orbicularis, there appears some unnatural disposition of the cartilage to turn inwards, it may be proper, after removing the cutaneous fold, to snip off some of the fibres of the muscle, so as to form a firmer cicatrice, actually fixed to the cartilage. Mr. Haynes Walton[3] insists particularly on the removal of the ciliary portion of the orbicularis, conceiving the disease to depend on its inordinate action.

The portion of skin to be removed might be destroyed by the actual cautery, or by escharotics; but the operation just described is much to be preferred. The escharotic employed by Helling[4] and Quadri[5] for this purpose is concentrated sulphuric acid, which is applied in the following manner:—

The skin of the inverted lid, to the breadth of about three lines, and one line from its tarsal edge, is to be rubbed with the acid, by means of a pencil of wood dipped in it, with the precaution of not taking up more than what merely wets the pencil. After ten seconds, the part is to be dried, and the acid re-applied, and this even a third or a fourth time, until a sufficient eschar has been formed, or a marked contraction has taken place. The part is then to be carefully washed. Of course, great care must be taken that none of the acid gets into the eye. After a time, it may be necessary to repeat the operation.

Instead of a horizontal, some surgeons, as Janson of Lyons, cut out a vertical slip of skin, and bring the edges of the wound together in the usual way.[6]

4. In *chronic* entropium, neither the operation with the scissors, nor the application of escharotics, is, in general, of any use. In slight cases, however, where the tarsus is but little affected, it may be proper to try the effect of removing a fold of skin, especially if it be the lower lid which is affected. Acute inversion is curable by an operation on the skin, by shortening in fact the skin of the affected lid, and binding down the tarsus to the cicatrice; but in chronic inversion, we generally find that nothing done to the skin merely is of much service. Portion after portion of it may be removed in advanced cases of this variety of inversion, but the disease continues as before. The altered condition of the tarsus prevents the lid from resuming its natural position. The lid, then, must be attacked in a different way. Saunders[7] cut out the tarsus of the upper lid altogether, along with the roots of the cilia; others have amputated the entire edge of the lid, or extirpated the bulbs, as has been explained in the preceding section.

As an evident shortening of the lid in the transverse direction attends the inveterate cases of this kind of inversion, and produces a degree of constriction on the eyeball, an idea suggested itself to Ware, that the lid in such a state might be relieved by a perpendicular incision through its whole thickness, either at its temporal extremity, or in its middle. Such an incision would at least release the eyeball from the state of pressure caused by the contracted lid; and if left to itself, to be filled up by granulation, might allow a permanent elongation of the lid in the transverse direction.

It was probably from this hint of Mr. Ware, that Sir P. Crampton was led to devise the following operation for the relief of inveterate cases of chronic inversion. Supposing it to be the upper lid which is affected, it is to be divided perpendicularly, for the length of from a quarter to half an inch, close to its temporal extremity[8], with straight probe-pointed scissors. A similar incision is then to be made at the nasal extremity of the affected lid, taking care to avoid the punctum and lacrymal canal.[9] These incisions being made, the eyelid immediately feels unconfined; it can be lifted from the eyeball, and the patient is already freed from a great part of his uneasiness. Were we now to leave the lid to itself, it would speedily resume its former place, the incisions by which we had liberated it, would unite by the first intention, and no permanent relief would be effected. To prevent immediate union, Sir P. Crampton employed an instrument similar to Pellier's speculum (*Fig.* 27. B), by which he kept the eyelid constantly suspended, and permitted only a slow union by granulation. Instead of using the speculum, Mr. Guthrie recommended a fold of the skin of the affected lid to be excised, exactly as in the operation for acute inversion; the edges of the wound, made by the removal of this fold, to be brought together by two or three stitches; and then, by means of three ligatures, inserted through the edge of the lid, and fixed to the forehead by strips of plaister, the lid to be kept elevated for eight or ten days. Over the everted lid, a bit of spread lint is to be applied, and a roller round the head. The perpendicular incisions slowly fill up by granulation; the slower the better; we ought daily to separate their edges with the probe, and touch them with sulphate of copper, to hinder them from healing rapidly; the union, when at length completed, does not comprehend the orbicularis palpebrarum; the divided fibres of the muscle shrink, like the divided ends of every other muscle; the diseased cartilage, in the meantime, loses also much of its induration and irregularity, and thus the lid, when re-united, is found improved in structure, and almost natural in position.[10] Such, at least, is the hope held out by the favourers of this mode of cure. I am sorry to say, that my experience of this operation has not been satisfactory. Temporary relief it certainly affords; but after the healing process of the vertical incisions is complete, the lid is generally found nearly in as bad a condition as it was before the operation. On this subject the reader may consult, with advantage, Mr. Wilde's paper on Entropium and Trichiasis, in the Dublin Journal of Medical Science, for March 1844. A surer method of relieving chronic entropium will be found in Jäger's excision of the bulbs of the cilia, as described in the last Section.

Mr. Wharton Jones informs me, that in chronic cases of inversion of the lower eyelid, he has performed the following operation, with perfect success. Having made an incision through the whole thickness of the lid, perpendicular to its edge, near the outer canthus, he cuts out a piece of the skin, and, by means of the thread forming the suture, fixes the lid in the everted position.

SECTION XXXVI. — ANCHYLOBLEPHARON.

This, although strictly a disease of the eyelids, I shall consider along with symblepharon, in a following Chapter, among the diseases consequent to the ophthalmiæ.

SECTION XXXVII. — MADAROSIS.

Μαδάρωσις, from μαδὸς, *bald.*

Partial madarosis is common after hordeolum, and after small-pox, the abscesses seated on the edge of the eyelid destroying the bulbs of the cilia. Neglected ophthalmia tarsi is apt to end in a more extensive madarosis of the same kind. The cilia, of which the bulbs have been destroyed, cannot be reproduced.

Both the cilia and the hairs of the eyebrow are liable to fall out, from different constitutional diseases; but in this case they generally grow again. The want of the eyelashes and hairs of the eyebrow is productive of frequent nictitation, in order to moderate the glare of day, and prevent the entrance of foreign particles into the eye.

Case 158. — I was consulted, some time ago, by a man who had lost every hair of his body. His head was perfectly bald, he had no eyebrows nor eyelashes, his beard was gone, no hair in the armpits, on the pubes, nor on the limbs. He was anxious to regain chiefly the eyebrows and eyelashes, as he found his eyes much weakened by the want of them. He was inclined to attribute his disease to some slight venereal complaint, which had been cured by mercury.

I was consulted also by a lady, who had sustained a similar loss of the whole hairs of the body.

The treatment, both local and general, already recommended for ophthalmia tarsi, must be carefully adopted in cases of threatened

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[1] See Ammon on Phimosis Palpebrarum, in Zeitschrift für die Ophthalmologie; Vol. ii. p. 140; Dresden, 1832.

[2] See Bowman, in Braithwaite's Retrospect of Medicine and Surgery; Vol. xxiii. p. 264; London, 1851.

[3] Operative Ophthalmic Surgery, p. 160; London, 1853.

[4] Hufeland's Journal, 1815; St. 4. p. 98.

[5] Annotazioni Pratiche sulle Malattie degli Occhi; Vol. i. p. 69; Napoli, 1818.

[6] Carron du Villards, Guide Pratique; Tome i. p. 326; Paris, 1838.

[7] Treatise on some practical points relating to the Diseases of the Eye, p. 41; London, 1811.

[8] If the incision, as directed in the text, is made close to the temporal extremity of the lid, it will cut through the glandulæ congregatæ, and some of the lacrymal ducts. Unless the inversion extends, therefore, to the very angle, it may be proper to avoid these parts, by keeping a line or two from the extremity of the lid, and towards the nose.

[9] Sir P. Crampton cut through the lacrymal canal; but ever since I began to give lectures on the eye, in 1818, I have directed this to be avoided. I have always discountenanced also the transverse incision of the conjunctiva, recommended by Sir Philip; and insisted particularly on the propriety of following up the first steps of this operation, by the extirpation of a transverse fold of the integuments. In Mr. Guthrie's modification of the operation, the cartilage is divided transversely, as well as the conjunctiva.

[10] Essay on the Entropeon; by Philip Crampton, M.D.; London, 1806: Lectures on the Operative Surgery of the Eye; by G. J. Guthrie, p. 31; London, 1823: Jacob, in Dublin Hospital Reports; Vol. v. p. 389; Dublin, 1830.

madarosis. In constitutional cases, tonics are to be employed both internally and externally, as it is evident that weakness has much to do in the production of the disease. Cinchona is particularly recommended internally, and an infusion of the petals of the rosa centifolia in wine, as a collyrium. When there is a suspicion of syphilis being the cause, mercury and sarsaparilla should be tried. In such cases as those to which I have referred, artificial eyebrows may be applied with advantage.

SECTION XXXVIII.—PHTHIRIASIS OF THE EYEBROW AND EYELASHES.

Φθειρίασις, from φθείρ, *louse.*

Fig. Dalrymple, Pl. VI. *fig.* 6.

Phthiri or crab-lice sometimes lodge among the cilia and eyebrows, where they keep up a chronic inflammation, and cause intolerable itching. They are so small that they may escape observation, unless a lens is employed in examining the parts. Their ova give the cilia n appearance of being covered with a black powder.

" A child came to the Infirmary," says[1] Mr. Lawrence, " complainng of the eyes being sore, and said they itched very much. I looked the eye, and could not see much the matter, but I thought that the cilia had rather a thick appearance, and on a more accurate examination, I found that this was caused by an infinite number of pediculi sticking over the hairs. I ordered the free application of the citrine ointment, and wished to see its effect; but the mother, who came with the child, was so much offended at being told the cause of the complaint, that she did not bring the child back again."

In such cases, some mercurial salve, as that recommended by Mr. Lawrence, and attention to cleanliness, will generally be effectual; although the disease sometimes resists mercurial salves for a considerable time. After rubbing the eyebrow or edge of the eyelid with mercurial ointment, or bathing the part with a solution of two grains of corrosive sublimate in an ounce of distilled water, taking care to avoid the eyeball while using the latter application, we should endeavour to dislodge the phthiri with a small spatula or forceps. This should be repeated twice or thrice a-day.

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[1] Lectures in the Lancet, Vol. x. p. 323; London, 1826.

CHAPTER IV.

DISEASES OF THE TUNICA CONJUNCTIVA.

The principal morbid affections of the conjunctiva fall under the heads of the *Ophthalmiæ*, and *Consequences of the Ophthalmiæ.* There are, however, a few diseases of this portion of the tutamina oculi, which, I conceive, it will be convenient to introduce here. We have considered the diseases of the secreting lacrymal organs; the tears flow from them over the conjunctiva; this conducting organ of the tears seems, then, naturally to claim our attention, before proceeding to the excreting lacrymal apparatus.

The conjunctiva is a transition-structure between mucous membrane and skin, connected to the neighbouring parts by areolar tissue. This tissue is liable to phlegmonous inflammation, inflammatory œdema or chemosis, and to ecchymosis, and emphysema; while the conjunctiva itself is chiefly subject, on the one hand, to blenorrhœal inflammation, and, on the other, to a variety of eruptive diseases. We meet with fungus, warts, and tumours of the conjunctiva. In some cases, its papillary structure is affected with a morbid degree of development; while, in other cases, the conjunctiva seems to lose its faculty of secreting mucus, and becomes dry and contracted. The compound nature of the membrane, expressed by the term *muco-cutaneous,* serves as a key to its pathology.

SECTION I. — FOREIGN SUBSTANCES ADHERING TO THE CONJUNCTIVA.

1. Particles of dust, bits of straw, parings of the nails, the nibbings of pens, small insects, and the like, getting into the eye, to use the common phrase, by which is meant getting into one or other of the conjunctival sinuses, are gradually ejected by the natural movements of the eyelids, the upper lid bringing them down in the act of nictitation, while the lower shoves them on towards the nose, till they are fairly placed on the caruncula lacrymalis, whence, perhaps some hours after their intrusion, the instinctive application of the finger removes them entirely. If the foreign substance, however, adheres to any part of the conjunctiva, it then gives more than ordinary uneasiness, and the patient either makes attempts himself to withdraw it immediately, or seeks relief from the hand of another. His own attempts are often fruitless; and it is amazing how often medical

practitioners dismiss, unrelieved, those who apply to them under such circumstances, simply from not everting the upper lid, on the inner surface of which, in nine cases out of ten, the foreign body will be detected. The case being left in this way, the pain may gradually subside in the course of a day or two, so that the patient may forget the accident, and not know to what cause to ascribe the inflammation which gradually develops itself in his eye, and persists obstinately, notwithstanding the use of various means, till the lid is examined, and the foreign body detected and removed.

Blown into the eye by the wind, foreign particles, in general, adhere merely to the conjunctiva, often to the conjunctiva corneæ, and rarely penetrate into or under that membrane. If they are lying on the surface of the ocular conjunctiva, they are seen at once on opening the eye, and are easily removed with the point of a toothpick, or the edge of a small elastic silver spatula (*Fig.* 31.). The latter instrument answers extremely well for the removal of particles adhering to the surface, or imbedded in the epithelium of the cornea.

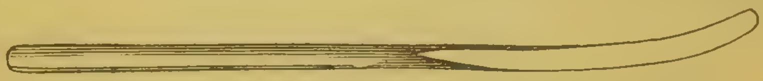

Fig. 31.

It is remarkable that those very minute foreign bodies of a black colour, vulgarly called *fires*, are never met with over the sclerotica, but only on the cornea, sometimes just at its edge, but generally near its centre or on its lower half. Notwithstanding their general resemblance, they are not all of the same nature. Sometimes they are particles of iron, which have been projected in an ignited state against the eye, when a person is striking fire with flint and steel, sharpening iron instruments, and the like. Dr. Schindler has shown[1] that they appear smooth and round, when viewed with the microscope. They lie more or less firmly in the little pit they form for themselves in the cornea; and, even when they remain there for weeks, may leave no oxide behind them.

In other cases, the foreign bodies in question consist of minute, unignited, metallic splinters, driven with force against the eye; as sometimes happens in filing or turning iron. Being sharp and angular, they remain firmly wedged in the epithelium of the cornea; and their fine points, having become oxidized, are apt to break off when the bodies themselves are removed, and leave a reddish brown stain of the cornea. After removing such bodies, we find they are not attracted by the magnet, till they are allowed to dry; then they spring to it. Their minuteness and fixed position in the epithelium, prevent their doing this, while attached to the eye.

Almost as common as the above mentioned are little black bodies, not of metallic origin, and often vegetable. Sometimes, on examining them with the microscope, they are discovered to be the germs of grasses; in other cases, particles of coke or coal. With the naked eye, it is often impossible to distinguish between these and metallic particles. It is to be observed, that it is not necessary for a foreign particle to be iron, to leave a rusty spot after it falls off or is removed artificially. The same thing may arise from vegetable, as well as mineral or metallic, substances. By and by, the rusty spot is thrown off, and no trace of the injury left, unless ulceration has supervened.

Dr. Schindler does not think the presence of such foreign bodies as have just been described, very productive of danger; and undoubtedly, the eye is much more frequently destroyed by the rude attempts of smiths and other ignorant people to remove such bodies from the cornea, than when they are allowed to remain and drop out of themselves. That they should always be removed, however, is certain, and if merely imbedded on the surface of the cornea, the best instrument for the purpose is the small spatula figured above. The operator raises the upper eyelid with his thumb, taking care not to touch the lower eyelid nor the cilia of either eyelid; he now tells the patient to look at him, and with the edge of the spatula the foreign body is in general easily unseated. This is not the method recommended by Dr. Schindler, who uses a camel-hair pencil for the purpose; a safer instrument, certainly, than the extraction-knife, but which in many cases would be found insufficient to effect the object in view.

It sometimes happens that the irritation does not attract sufficient attention, so that the foreign substance is left adhering to the conjunctiva for days, or even for weeks, or months, bringing on inflammation, or even ulceration, without any attempt being made to discover the cause, or to remove it. On the surface of the cornea, this may give rise to a permanent speck or opacity.

2. Foreign substances, adhering to the eye, not unfrequently simulate the appearances of pustules, specks, &c., as the following cases will show:—

Case 159.—Daniel Newton, aged 14, from Paisley, applied at the Glasgow Eye Infirmary, on account of considerable pain and inflammation of the left eye, which had continued for two months, notwithstanding the application of a salve, a sugar of lead poultice over the lids, leeches, and repeated blistering. There was a small semi-opaque elevation, running nearly in a vertical direction, and occupying the centre of the cornea. Its figure being different from that of any ordinary pustule or speck, I touched it with the convex side of a small hook, when it instantly separated from the cornea, and proved to be what, in Scotland, is known by the name of a *meal-seed*, that is, a fragment of the husk of a grain of oats, about the sixth of an inch in length, and the fortieth of an inch in breadth. The cornea, where the foreign substance had adhered, appeared slightly nebulous. Eight days after, the inflammation was completely gone, the cornea natural, and vision perfect.

Case 160.—A child of three months was brought to me by its mother, who said that one of the eyes had been inflamed for six weeks, and that a speck had grown on it. Different remedies had been tried, and a blister recommended. On examining the eye, I found one half of the husk of a phalaris seed adhering to the cornea, a little below the level of the pupil, simulating, to an inexperienced or careless observer, a speck or pustule. It was easily removed with the point of a tooth-pick.

Case 161.—An infant, ten weeks old, was brought to me by its mother, who said there was a speck on one of its eyes, for which she had been using a solution of caustic, given by her medical attendant. She had observed the speck for three weeks, but knew no change in its appearance. It had exactly the colour of a thin leucoma, and did not seem in the least elevated; but as it was square-shaped, I immediately suspected it to be the fragment of some seed, and lifted it off with the spatula.

Case 162.—A child was brought to me with severe inflammation of one of its eyes, and puriform secretion from the conjunctiva. From under the edge of the upper lid there projected a black roundish body, which, at first view, I was afraid might be a protrusion of part of the iris through an ulcer of the cornea. The parents were of opinion that the eye was gone, and evidently laboured under some notion of the same kind as that which occurred to myself, when I laid down the child to examine the exact state of disease. How great was my surprise when, on raising cautiously the upper eyelid, I found this was a case, not of figurative, but of real *myocephalon!* A common house-fly was fairly lodged, and had been so for eight days, between the eyeball and the upper eyelid; its head only projecting in the manner described, and producing an appearance as if the eye were disorganized.

3. It is remarkable how tenaciously a foreign substance will adhere to the surface of the eye. The surrounding vessels become distended with blood, and the portion of conjunctiva covered by the foreign body soon puts on a fungous appearance.

Case 163.—A child of 4½ years was brought to me from the country, with a black substance firmly adhering to the conjunctiva covering the sclerotica. It was supposed to be a bit of coal, and several attempts had been made to remove it. Laying the child on its back, fixing its head between my knees, and steadily elevating the upper eyelid, I laid hold of the foreign substance with a pair of forceps. It came away, leaving the portion of conjunctiva which it had covered, in an inflamed and fungous state. On examination, it proved to be half the husk of a hemp seed, which had stuck to the eye by its concave surface, and had become blackened by imbibing moisture from the conjunctiva. It had remained for seven days in the situation in which I found it.

4. If the foreign body is not visible on the surface of the eyeball, it will sometimes come into view, on drawing down the lower lid. If nothing is discovered in the lower sinus of the conjunctiva, then the upper is to be examined. This is done by making the patient lean his head back and look towards the ground, while we raise the lid and look under it; or we at once evert the upper lid, in the following manner. We lay hold of the eyelashes with the finger and thumb; and whilst by this means the edge of the lid is drawn outwards and upwards, a slight counterpoise is to be made with the round end of the small spatula, on the outer surface of the lid, opposite to the upper edge of its cartilage. Between these two forces the lid is readily everted, so that its internal surface is exposed. In many, indeed in most cases in which a particle of dust lodges in the eye, a single black point will be observed adhering to the inside of the everted lid, and can readily be removed. The foreign particle, however, may be a minute fragment of some transparent substance, and may not be detected, unless with the spatula or the point of the finger we go over the surface of the conjunctiva. The intolerable pain, and violent spasm of the orbicularis palpebrarum, which generally attend the presence of a foreign particle fixed on the inside of the upper lid, subside almost immediately on its being removed. The turgidity of the capillaries of the conjunctiva, resulting from the increased attractive force of the irritated tissue on the blood, also speedily disappears.

If, after the foreign substance has been removed, the spasm of the orbicularis palpebrarum should still continue, which is particularly apt to be the case when the conjunctiva has been both mechanically and chemically injured, the patient ought to remove to a dark room, lie in bed, paint the eyelids with extract of belladonna, and keep a pledget, wet with cold water, over the eye.

The whole of the upper conjunctival sinus cannot be brought into view by eversion, so that, if we have any reason to think that a foreign body is lodged in the remote part of the fold, we must wash it out by means of a syringe and tepid water, or employ the spatula in searching for it, and bringing it down.

5. It is remarkable, that while the smallest particle of dust, fixed on the internal surface of either eyelid, but especially the upper, generally gives rise to intolerable uneasiness, foreign bodies of considerable size may lodge in the deeper and looser part of the conjunctival folds for many weeks, without inducing any violent symptoms. The conjunctiva, in such circumstances, inflames and is apt to throw out a fungous growth, which may completely envelope the foreign substance, so as to hide it from view, and lead the practitioner to adopt a false notion of the case. Not suspecting the presence of any foreign body, he may be led to think that he has to do with hypertrophy or polypus of the conjunctiva.

Case 164.—A young girl had a soft red fungus growing out of the eye, as large as a filbert. It was of some weeks' standing, and was attributed to a hurt inflicted by a straw striking the eye. The fungus originated in the conjunctiva where it is reflected from the lower eyelid to the eyeball. It was cut away; but in three weeks was as large as ever. It was again removed; and at the angle of reflexion of the conjunctiva, a bit of straw, half an inch in length, was observed and extracted. The cure was complete in a few days.[2]

Case 165.—A man consulted Dr. Monteath on account of an inflamed state of his eye, induced by a fall, five months before, among some bushes in descending a steep mountain. He felt some part of his eye wounded at the moment, and had never enjoyed freedom from a tender state of it, from that period, though he had applied a great variety of medicines. On everting the upper eyelid, a fungous state of the conjunctiva was discovered very high up in the angle of reflexion of that membrane, and on examination with the probe, it was evident that a foreign body remained there. It was laid hold of, and extracted with the forceps, and proved to be a portion of a twig of a bush, ¾ths of an inch in length, and nearly as thick as a crow-quill. This substance had remained in the upper fold of the conjunctiva for five months, and had got into that situation without wounding the eye.[3]

Case 166.—A boy ten of years of age, having lain during the night on a sheet upon which ears of corn had been thrashed, awoke in the morning with his left eyelids swollen and painful. Notwithstanding the use of topical emollients, an abscess formed in the upper lid, which burst below the eyebrow towards the temple, and left an opening which could not be closed by any of the means which were employed. In process of time, the lid began to turn itself outwards, its membrane swelling and protruding, till at length the eversion was enormous.

About eight months from the first appearance of any disease, the fungous excrescence, formed by the internal membrane of the lid, covered a considerable part of the upper hemisphere of the eyeball, and kept the lid so much everted, that its margin, especially towards the temple, was almost close to the eyebrow. Pressed upon with the point of the finger, the lid yielded readily, and appeared as if it would have descended to cover the eye, had it not been for the intervention of this fungus, formed by its internal membrane.

As the fungus was dry and indurated, Scarpa ordered it to be covered for 24 hours with a bread and milk poultice; and then removed the whole of it with a stroke of the curved scissors, carefully avoiding the punctum lacrymale.

After the extirpation, a piece of straw, about an inch long, and half a line thick, was discovered in the fold of the fungus. The whole of the superfluous part of the internal membrane being now removed, the lid descended over the eye, so as to cover it properly. The operation was not followed by any remarkable symptom, and the boy, ten days afterwards, left the hospital so far cured, that no other defect remained, except a slight elevation of the lid near the external angle, where the abscess had burst.[4]

6. The eggs of insects are sometimes deposited between the eyelids, and may produce very serious mischief, as is well illustrated by the following case, related by M. Cloquet.

Case 167.—A man, of about 50, following the double business of public singer and rag-gatherer, fell asleep in the open fields in a complete state of intoxication. Flies of the species *musca carnaria* deposited their eggs in the entrances to the different natural openings of his body, between the eyelids, in the nostrils, in the ears, and in the prepuce. The eggs being hatched, the larvæ passed into the nose, the ears, the orbits, &c. Under the integuments of the cranium they formed large cavities, pierced with ulcerated openings, by which, on pressure, they escaped in thousands.

All the larvæ were extracted by the second day after the patient's entering the *Hôpital Saint-Louis*. The eyes were totally destroyed, and when the larvæ were removed through the perforations of the corneæ, the crystalline lenses escaped. The integuments of the upper part of the cranium fell into a gangrenous state, and the patient died a month after his admission, in a complete state of dementia, believing himself constantly pursued by assassins. The bones of the vault of the cranium were in part necrosed, and the dura mater and arachnoid inflamed.[5]

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[1] Ammon's Zeitschrift für die Ophthalmologie; Vol. v. p 64; Heidelberg, 1835.

[2] Monteath's Translation of Weller's Manual of the Diseases of the Human Eye; Vol i. p. 9; Glasgow, 1821.

[3] Ibid.

[4] Scarpa, Trattato delle principali Malattie degli Occhi; Vol. i. p. 170; Pavia, 1816.

[5] Pathologie Chirurgicale, par Jules Cloquet, p. 60; Paris, 1831. For other cases of larvæ under the eyelids, see Bouilhet, Annales d'Oculistique; Tome xv. p. 133; Bruxelles, 1846.

SECTION II.—DACRYOLITHS, OR LACRYMAL CALCULI, IN THE SINUSES OF THE CONJUNCTIVA.

Several cases are recorded of depositions of calcareous matter from the tears, forming concretions in the sinuses of the conjunctiva. From the large size of the masses, and their frequent recurrence, doubts have been entertained of the reality of the disease, the suspicion naturally arising that the substances extracted had for some sinister purpose been introduced into the eye. The chemical analysis, however, of the concretions, and the characters of the observers for exactness, remove this doubt.

Case 168.—In 1811, a small bit of lime fell from the ceiling of a room into the left eye of a healthy young woman. Professor Walther removed the foreign body, and the eye appeared to have sustained no injury. In February, 1813, the patient was first attacked with severe toothache, both in the upper and lower jaw. Several decayed molares, in which the pain was particularly violent, were extracted, but with merely temporary relief. Soon after this she had an attack of rather obstinate constipation, with other symptoms of colic; but by clysters, fomentations, &c. it was removed. Towards the end of July of the same year, she began to complain of a burning, stinging sensation in the left eye, most severe when the eye or eyelids were moved, or when she was exposed to bright sunshine. On closely examining the organ, a white angular concretion was discovered between the eyeball and the lower eyelid, towards the external angle of the eye. It was about the size of a pea, and, when removed from the eye, was readily rubbed down between the fingers into a greasy sandy powder. Although the patient firmly denied that any foreign body had fallen into her eye, Walther at first supposed, that the substance removed was a piece of lime which had just got into it. He was not a little surprised, however, when the patient returned to him, three days afterwards, with a calculus exactly like the first, lying in the very same place. The eye was now considerably inflamed, the pain not being confined to the eyeball, but extending in the direction of the supra-orbitary nerve. There was a proportionate sensibility to light, and increased flow of tears. The inflammation of the eye had commenced the preceding evening, accompanied by a violent paroxysm of fever, with shivering, succeeded by heat. Although the newly-formed calculus was immediately and easily removed, still, on the following morning, after a restless and distressful night, the violence of the inflammation was much increased, and in the lower fold of the conjunctiva another white crumbling concretion was perceived, which, by the succeeding day, had attained as large a size as the former. The upper eyelid was inflamed, and the margins of both swollen. The inflammation was so violent as to require blood-letting, and other antiphlogistic remedies. By these some alleviation was effected; but four days afterwards, another bleeding was necessary, from an increase of the inflammatory symptoms. In the meantime, the formation of calculi, at the same place in the affected eye, not only proceeded, but larger concretions were produced, and with greater rapidity. The calculi were now removed twice a-day, and at length three times a-day, from the eye.

Reasoning from the good effects of potash in calculous affections of the kidney, Walther prescribed a solution of a drachm and a half of carbonate of potash in 4 ounces of cinnamon water, with half an ounce of syrup. Of this solution, half a table-spoonful was taken four times a-day; and along with this the patient drank copiously of an infusion of the viola tricolor. After using these remedies for six days, during which time the urine was muddy and fœtid, and deposited a copious sediment, the activity of the disposition to form calculi greatly diminished. In the course of 24 hours, there was but one small concretion formed, and at length merely a white crumbling powder, no longer consolidated into a mass, and which required to be removed only every second day. But while the disease in the left eye decreased and disappeared, it attacked the right, and at the same part of the conjunctiva, between the eyeball and lower eyelid. Its course here was exactly the same as before; at first, the calculi formed in fewer numbers, and more slowly, afterwards more rapidly, and in greater numbers; the inflammation of the right eye was at first moderate, and afterwards more severe, rendering repeated venesection necessary. Nevertheless, the disease never attained the same height, and was of shorter duration than in the left eye. It gradually decreased as it had increased; the concretions appearing at longer intervals, becoming smaller, and at length entirely ceasing. The whole course of the disease occupied nearly ten weeks.

The patient's chest seemed to suffer in some degree, from the repeated blood-letting, altered manner of life, and perhaps from the continued use of alkaline medicine; she had a troublesome cough, with considerable expectoration, particularly in the morning, and an altered appearance. Walther, therefore, ordered her an infusion of lichen Islandicus, and better diet. In three weeks, she had perfectly recovered.

Some years after this, however, she was again attacked with the same disease. Concretions of the former colour, size, and other properties, formed in the left eye; at first, they lay between the eyeball and under eyelid, and afterwards between the eyeball and upper eyelid. In the course of a few days the formation of calculi began in the right eye. On this occasion both eyes were less severely inflamed, and the disease was likewise of shorter duration. Walther immediately ordered her the solution of potash. The number of calculi which were daily generated, soon diminished, and the whole process ceased in shorter time.

On analysis, the concretions were found to be composed of carbonate of lime, which formed the greatest part of their weight; traces of phosphate of lime; and coagulable lymph or albumen. They consequently resembled salivary calculi, and the tartar deposited on the teeth.[1]

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[1] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. i. p. 163; Berlin, 1820.

SECTION III. — INJURIES OF THE CONJUNCTIVA.

§ 1. *Mechanical Injuries.*

1. Incised wounds of the conjunctiva rarely present themselves, without the sclerotica being also divided. I have seen, however, several cases of this kind. In one of them the wound was inflicted with a sharp bit of glass. It healed readily, although the lips gaped more than I could have anticipated.

2. I have seen many cases of severe pain and lacrymation, following slight scratches of the epithelium of the cornea, by the finger nails of

infants carried in arms. The feeling which the patient experiences is that of a particle of sand behind the upper lid. The excessive uneasiness is often remarkably alleviated, in the course of a few minutes, by painting the extract of belladonna over the eyelids and eyebrow. Cold water cloths should be laid over the belladonna. In two or three days, the epithelium is regenerated, and the eye perfectly well.

Somewhat similar, only much more serious in their effects, are abrasions of the cornea, happening to reapers, during harvest, from the ears of corn. My experience as to the danger, in cases of this sort, agrees with that of Professor Walther, who states[1] that in the Isar district of Bavaria alone, from 50 to 60 eyes are annually lost from the inflammation originating in this kind of injury during harvest. The patients in this part of Scotland are chiefly females, and much of the bad effects is no doubt attributable to neglect. The internal textures of the eye inflame, the cornea becomes infiltrated with pus, and bursting, gives rise to staphyloma. The symptoms altogether bear a close resemblance to those of catarrho-rheumatic ophthalmia, and the most active measures are required to save the eye. Depletion, and mercurialization are necessary, together with the use of belladonna.

3. A foreign body, if hard and angular, may penetrate through the sclerotic conjunctiva, and either be driven under the membrane for a considerable way, at once, by the projectile force with which it was sent aginst the eye, or afterwards be gradually insinuated under it by the pressure of the eyelids. In such cases, it is sometimes necessary to raise a portion of the conjunctiva with the toothed forceps, and snip it off along with the foreign substance. If this is not done, the conjunctiva heals over the foreign body, and the irritation ceases. Mr. Wardrop[2] tells us, that in one case he found a piece of whinstone, enclosed in a sac of cellular membrane, lying close to the sclerotic coat, where it had remained for ten years prior to the person's death, without his experiencing the least uneasiness, or even suspecting its presence. The same author[3] quotes, from Loder's Journal, the following instance of a foreign body, which, having penetrated the sclerotic conjunctiva, gradually advanced to the central part of the cornea: —

Case 169.—A priest requested assistance for a dark speck on the cornea of his right eye, which greatly impaired his vision. Two years before, he suddenly experienced a little pain in that eye, and on examination, remarked on the white of it, below the upper lid, a black spot, which not hurting his sight, and the pain soon going away, he took no further notice of the accident. After some time, he was aware that the spot had changed its situation, and appeared at the union of the cornea with the sclerotic. The speck continued its progress very slowly, but uninterruptedly; it came forwards on the cornea, and at last covered a portion of the pupil. There was a prominent hard spot upon the cornea, equalling in size a small lentil, but longer than it was broad. Many small red vessels appeared like streaks around it. The patient had no pain. The hardness of the speck, and other circumstances, made the surgeon suspect that a foreign body was fixed on the eye. He made an incision over it, and, with the assistance of a magnifying glass, saw a black body, which he removed with the point of the knife, from the small cavity it had formed for itself in the cornea. It proved to be the hard wing-case of a beetle.

The change of place, in such cases, is to be attributed, I presume, to the pressure of the eyelids in the act of nictitation.

4. The stings of insects sometimes fix in the conjunctiva, and are to be carefully removed, either by a pair of forceps or the point of a cataract needle.

§ 2. *Burns and other Chemical Injuries.*

Fig. Wardrop, Vol. I. Pl. V. *fig.* 3.

1. Lime, whether in the state of quicklime, or slaked lime, or mixed with sand so as to form mortar, acts very injuriously on the conjunctiva. It is also apt to affect violently the proper substance of the cornea, and sometimes totally destroys the eye. One of the first effects observed to arise from the intrusion of lime, in any of the above-mentioned states, is, that the sclerotic and palpebral portions of the conjunctiva become white, swell, and peel off, being in fact decomposed by the caustic action of the substance. The corneal epithelium suffers a similar change. This decomposition of the conjunctiva is produced very rapidly, so that it can very rarely be prevented by a removal of the lime. When the corneal conjunctiva has peeled off, in only a small portion of its extent, a shallow depression is visible on the surface of the cornea, with irregular edges. If the whole has separated, the proper substance of the cornea appears perfectly smooth, and presents more or less of a blue pearly whiteness. The eye may be destroyed, although no part of the conjunctiva has peeled off.

The ultimate effects arising from the intrusion of lime into the eye, depend on the degree of causticity, the quantity, and the length of time that the substance has been allowed to remain in contact with the conjunctiva. Common mortar falling into the eye, and quickly removed, generally acts only as a severe stimulant, causing increased redness, pain, and epiphora, followed by a puro-mucous discharge from the conjunctiva. But even when quickly removed, I have seen mortar cause swelling of the conjunctiva, whiteness and bursting of the cornea, and loss of vision. In one case, the cornea became gradually thin and disorganized, and burst three weeks after the injury. Allowed to remain for days in the conjunctival folds, I have seen mortar followed by sloughing of the conjunctiva, permanent nebula of the cornea, and partial symblepharon. Slaked lime, thrown into the eyes, acts more powerfully, and is apt to be followed, especially if not speedily removed, by complete opacity of the cornea, or even by suppuration of that part, and staphyloma.

Case 170.—A child, two years old, was brought to the Glasgow Eye Infirmary, who, three weeks before, had fallen among quicklime, which had intruded into both eyes. A poultice had been applied immediately after the injury, and no attempt made to remove the lime, or counteract its effects. On examination, I found the right cornea totally opaque, small, and deformed. There was no appearance of cornea in the left eye, which had shrunk to a very small flat stump.

Case 171.—Robert Gray, aged 13, a slater, was admitted at the Glasgow Eye Infirmary, 3rd September, 1838.

On the 28th ult. a quantity of mortar was thrown into his left eye. The skin of the left eyelids and cheek is inflamed, and the eyelids swollen. He is unable to open the eye, except to about half its usual extent. The conjunctiva covering the eyeball, and that lining the upper eyelid, presents a white scarred appearance; that lining the lower eyelid is more natural. Shreds of the conjunctiva are coming away in a sloughy state. A considerable quantity of mortar is still lodged between the eyeball and the upper eyelid, being impacted between the two surfaces. The conjunctiva corneæ looks as if it had been immersed in boiling water, especially the upper half of it. Vision of the injured eye is very dim; although he can read with it the large letters on the Infirmary card. The first day after the injury, the eye was affected with severe burning pain, which subsided after the application of a poultice. At present, he does not make much complaint of pain. He says his master removed a quantity of the mortar immediately after the accident. When the eye is held open for a few minutes, the cornea appears to become quite dry, and when viewed through a lens, presents the appearance of cuticle. Immediately on being shut, it becomes bedewed with tears, and assumes a less opaque appearance.

The remainder of the mortar was carefully removed when he came to the Eye Infirmary; the solution of nitrate of silver was applied to the conjunctiva; and eight leeches to the eyelids.

Sept. 4th, A good night. Opens the eye better. He was ordered a purging powder; the red precipitate salve to the edges of the eyelids at bedtime; a collyrium with wine of belladonna; and a blister behind the ear.

5th, Conjunctiva looks rather better. Moves the eye more freely. He had a dose of sulphate of magnesia.

6th, Cornea rather clearer.

10th, Three leeches to the left lower eyelid.

12th, Lower half of cornea considerably clearer.

19th, Three leeches to the inner angle of the eye. Blister repeated.

22nd, Diluted wine of opium substituted for the solution of nitrate of silver.

29th, A considerable part of the conjunctiva corneæ appears to have separated. Whole cornea more opaque. Conjunctiva less inflamed.

7th Oct. An evident deficiency in the conjunctival covering of the cornea. Cannot tell one finger from another with left eye.

28th, Left cornea smooth and clearer.

4th Nov. Continues to improve.

11th, A conjunctival frænum extending between the upper eyelid and margin of the cornea, towards inner angle. Cornea still very nebulous. General appearance of eye more healthy.

7th April, 1839, Cornea much clearer, except towards its upper inner margin, in the vicinity of the symblepharon. Reads a small type with left eye.

In whatever state the lime may have been, which has intruded into the eye, it ought instantly to be removed. For this purpose the eye is to be opened, the lids everted one after the other, and with the finger nail, or the small spatula, every particle of the foreign substance picked out. It often adheres pretty firmly to the conjunctiva, so that the aid of forceps is necessary to detach it. After so much has been removed in this way as seems possible, a continued stream of cold water should be sent over the eyeball and inside of the lids, by means of a syringe, so as to wash away every particle of the lime.

The patient should now go to bed, the eyelids and eyebrow should be painted over with the extract of belladonna, and a compress, wrung out of cold water, laid over the eye. The solution of the nitrate of silver (gr. iv–x to ℥i of distilled water) operates favourably in abating the puro-mucous conjunctivitis which follows, but the more serious inflammatory symptoms must be combated by bleeding, calomel and opium, and counter-irritation. Solution of acetate of lead must carefully be avoided, as the lead will be precipitated on the excoriated parts, and form opaque scales, which can seldom be removed.

If the inflammation which follows is moderate, the epithelium of the cornea, in those cases where it peeled off, is slowly regenerated, and vision may be perfectly restored. If the lime has acted more deeply, or severe inflammation ensued, the cornea may never regain its transparency[4], although it still retains its form.

2. Particles of potash, nitrate of silver, and other caustic substances, must immediately be extracted from the eye, with the forceps, or any other instrument which is at hand. The mixture of the tears with such substances increases their destructive effects.

I once saw severe inflammation of the conjunctiva, with considerable sloughing in the lower fold of that membrane, from red precipitate in powder, which an ignorant pretender had applied, to cure a slight ophthalmia. The sloughy conjunctiva came away in firm white pieces, leaving a raw surface. By care, symblepharon was prevented.

3. Hot and caustic fluids, such as boiling water, melted tallow, sulphuric acid, and the like, blister the conjunctiva, and bring on inflammation of a highly dangerous character.[5] Indeed, after sulphuric acid has been thrown into the eyes, a piece of diabolical malice, the effects of which I have repeatedly had occasion to witness, the conjunctiva almost appears scarred, being white, soft, and swollen. It afterwards peels off, while the cornea rapidly becoming disorganised by infiltration of pus, ulceration, and sometimes sloughing, a raw surface is left both on the ball and on the inside of the lids, ready to unite and close the eye by an incurable and almost total symblepharon. In other cases partial symblepharon is the result. A stream of tepid water, or of a solution of 4 grains of subcarbonate of soda to the ounce of water, injected over the whole surface of the conjunctiva, is the remedy to be had recourse to in the first instance. The inflammation which follows is to be combated by general and local blood-letting, calomel and opium internally, and the use of belladonna externally. Every care is to be taken to prevent anchyloblepharon and symblepharon, by opening wide the lids from time to time, and anointing them with tutty salve. A curious effect of a burn of the conjunctiva, which I have sometimes witnessed, is an ecchymosed state of the cornea, near the burned or scalded part of the conjunctiva, blood being effused into the proper substance of the cornea. This appearance is very slow of removal.

4. Vinegar, ardent spirits, and other stimulating fluids, thrown into the eye, occasion severe inflammation of the conjunctiva. From whisky, I have seen an inflammation of the conjunctiva, sclerotica, and cornea arise, very difficult to be overcome; and the same from the miserable trick of putting snuff into a person's eyes while asleep.

5. Dr. Ammon quotes[6] the case of a man, who, smearing the roof of the entrance to his house with melted pitch, had the misfortune to let a drop of that substance fall directly on the cornea, where it stuck so fast that the surgeons who were called were unable to loosen it, either by the application of instruments, or the use of an eye-water. The patient was advised to drop olive oil into his eye, and to cover it with a compress steeped in that fluid, the effect of which was that the pitch was speedily loosened, and quitted the eye without leaving any visible injury.

6. In consequence of the cornea being touched with a burning fragment of wood, with a piece of hot iron, or with melted iron or lead, we see the epithelium of the cornea, whitened, coagulated like a layer of albumen, raised into a blister, and separated. The effects are slight in some cases, and severe in others. Belladonna extract is applied to soothe the pain, and cold water is used as a lotion. Next day, the eye sometimes seems perfectly well, the epithelium being already regenerated. In other cases, the restoration is more slow. If the burn has extended to the anterior elastic lamina of the cornea, the effects are much more serious, including tedious ulceration. In children, the effects are generally very dangerous, the cornea suppurating and giving way, so as to leave the eye staphylomatous. The

palpebral and ocular conjunctiva suffer more or less severely from burns, such as from melted iron projected into the eye. Sloughing and symblepharon are common results of such an injury.

7. Gunpowder exploded into the eye fixes in the conjunctiva, and in the cornea, and must be carefully picked out with the small spatula, or the point of a cataract needle, else the membrane will close over the grains, so that they will remain indelible, and injure the transparency of the cornea.

8. Other substances sometimes leave an indelible stain of the sclerotic conjunctiva, unless carefully removed, along with the injured portion of the membrane. I have seen an injury with a piece of coal produce a permanent black mark; and Dr. Jacob mentions[7] that he had more than once seen the same thing arise from the thrust of a charred stick.

9. The conjunctiva often becomes indelibly stained[8] from the misapplication of nitrate of silver in solution; a remedy much abused by half-educated practitioners, who, unable to discriminate the proper occasions for its use, and too careless to apply it themselves, and watch its effects, hand it over to the patient, with a recommendation to employ it daily, till a cure of some inflammation of the eye, or some opacity of the cornea, is effected. At the end of some weeks, the conjunctiva acquires, from this application, a light ochre hue. If the solution has been strong, and used for months, the stain is much deeper, colouring not only the conjunctiva of the eyeball, but also that of the under eyelid, of a dirty olive, or even black colour, productive of permanent and very obvious deformity. To remove such discolouration of the conjunctiva, a solution of iodide of potassium, or of hyposulphate of soda, of the strength of 1 to 10 of water, has been recommended. Nitrate of silver, decomposed, and the oxide thrown down, sometimes becomes incorporated in a cicatrice of the cornea, and produces a black stain; but this event is rare.

10. If a solution of acetate of lead be applied to any part of the conjunctiva in an excoriated or ulcerated state, the acetate is decomposed, and a white precipitate is deposited, which adheres tenaciously to the conjunctiva, and as the membrane heals, becomes incorporated with the cicatrice. If this takes place on the surface of the cornea, it may greatly impede the vision of the patient. The appearance produced by deposition of lead on the conjunctiva cannot be mistaken, its chalk-like impervious opacity easily distinguishing it from the densest cicatrice resulting from mere ulceration.

Case 172.—In a schoolmaster, whisky being thrown into one eye, brought on ulceration of the cornea. Sugar of lead water was applied, and an opaque cicatrice followed of a triangular shape, and presenting three laminæ of different degrees of opacity. The centre, where the ulcer had been deepest, was chalky, the next layer less white, and the next, the most extensive, still less so, presenting altogether a resemblance to the section of an agate.

Solution of nitrate of silver, 10 grains to 1 ounce of distilled water, applied daily to such deposits of lead, sometimes removes them entirely, where the ulcer has not been deep.

In one case, I succeeded in separating a scale of lead which had been deposited on the cornea; but, in general, the lead is so incorporated with the cicatrice as to be immovable.

The inflammation which follows the various injuries we have considered in this section, not only varies much in degree, but is by no means of uniform character. When it confines itself to the conjunctiva, it is sometimes puro-mucous, sometimes eruptive. But it frequently affects the proper textures of the eyeball; such as, the cornea, the sclerotica, or the iris. Of course, rest, and the antiphlogistic regimen, are necessary in every case of injury of the eye. The local applications must be regulated by the peculiar symptoms excited, and even the internal remedies to be employed are not of that uniform sort with which inflammation, in less complicated parts of the body, is usually treated. The grounds of this doctrine will be more fully explained under the head of *Traumatic Ophthalmiæ*.

In almost all the injuries of which we have been speaking, the external use of the extract of belladonna ought to be adopted, not for the purpose so much of dilating the pupil, as for acting as an anodyne on the branches of the fifth nerve, which it does in a very remarkable manner.

Before quitting this subject, it is right to state, that recovery from the immediate effects of many of the injuries described, not unfrequently takes place, to be followed, after an interval of some weeks, by very serious internal inflammations of the eye, embracing the cornea, the iris, and even the retina.

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[1] Merkwürdige Heilung eines Eiterauges, p. 25; Landshut, 1810.

[2] Essays on the Morbid Anatomy of the Human Eye; Vol. i. p. 70; London, 1819.

[3] Ibid.

[4] Jacob, Dublin Journal of Medical Science; Vol. ix. p. 75; Dublin, 1836: Wardrop, Op. cit.; Vol. i. p. 160.

[5] On opacity of the cornea, produced by sulphuric acid, see Thomson, Lancet, Oct. 31, 1840, p. 209.

[6] Zeitschrift für die Ophthalmologie; Vol. ii. p. 155; Dresden, 1832.

[7] Dublin Hospital Reports; Vol. v. p. 371; Dublin, 1830.

[8] Ibid. p. 365: Solomon, Medical Times, October 4, 1851, p. 350.

SECTION IV. — SUBCONJUNCTIVAL ECCHYMOSIS.

Fig. Dalrymple, Pl. VII. *fig.* 1.

Extravasation of blood into the subconjunctival areolar tissue, occurs from various causes, as blows on the eye, blows on the eyebrow, gunshot and other wounds of the head or face, fits of coughing, fits of epilepsy, &c. I have seen a slight blow on the forehead produce ecchymosis beneath the conjunctiva of both eyes. In some cases, no evident cause appears why the vessels should have opened; for the patient on awaking in the morning finds the conjunctiva of a deep red colour, without any pain being present, or anything having happened likely to produce such an effect. The vessels which have given way, sometimes continue to give out blood under the conjunctiva, for days or weeks, so that the whole subconjunctival areolar tissue is injected, and the conjunctiva elevated by dark coagulated blood. Under these circumstances, the iris sometimes assumes a greenish colour. Subconjunctival ecchymosis has sometimes been observed in Asiatic cholera. It occurs in purpura and in scurvy;

and hæmorrhagy occasionally takes place from the conjunctiva in these diseases.

In ordinary cases, the extravasated blood is gradually absorbed, the conjunctiva becoming first yellow, and then resuming its natural appearance. A slightly astringent collyrium generally forms the whole treatment.

SECTION V. — SUBCONJUNCTIVAL EMPHYSEMA.

We have already (p. 175) explained, how, in cases of fracture of the nasal parietes, the eyelids are subject to emphysema, the air passing from the nostril, through the fractured bone, into their areolar tissue. From similar injuries, extending between the nostril and the orbit, the areolar tissue which connects the conjunctiva to the neighbouring parts, is sometimes filled with air.

Should the swelling from the effused air, prove so great as to give rise to pain, or impede the motion of the eyeball or eyelids, the conjunctiva may, from time to time, be punctured, so as to let the air escape, till the fracture is supposed to be consolidated. The patient ought to avoid forcible blowing of the nose, by which this emphysema, as well as that of the eyelids, is apt to be induced.

SECTION VI. — SUBCONJUNCTIVAL PHLEGMON.

Fig. Sichel, Pl. V. *figs.* 4, 5, 6.

The subconjunctival areolar tissue is occasionally the seat of phlegmonous inflammation. The affected part of the conjunctiva is injected with red vessels, much thickened, and after some days presents a prominence about the size of a split pea, which rarely goes the length of suppuration. This disease will easily be distinguished from any of the ophthalmiæ.

In one case, I observed an appearance resembling conjunctival phlegmon precede an attack of syphilitic iritis. In another case, a similarly thickened and inflamed patch of conjunctiva occurred, along with a syphilitic eruption; and in several instances I have seen the same appearance, investing an attenuated portion of the sclerotica, with protruding choroid. In all of these cases, the symptom in question yielded to mercury. Such cases might readily be mistaken for phlegmon. They will easily be distinguished from syphilitic chancre of the conjunctiva.

We might suppose slight injuries to be the most probable causes of subconjunctival phlegmon; but, like phlegmonous inflammation in many other situations, it generally arises without any evident cause.

Blood-letting of any kind is scarcely ever necessary in this complaint. The patient should be purged. Warm fomentations to the eye are to be used. If the phlegmon goes on to suppuration, it is to be opened with the lancet.

SECTION VII. — SUBCONJUNCTIVAL ŒDEMA.

Subconjunctival œdema sometimes occurs in small patches, especially on the temporal side of the eyeball; producing a feeling as if some foreign body were lodged in the eye, and proving, in this way, very annoying. The œdematous patches generally shrink under the application of stimulants, such as a solution of nitrate of silver, or the wine of opium. If this treatment does not succeed, the œdematous bit must be snipped off. The wound heals in a few days, and the disease is not apt to return. Sometimes the œdematous little fold degenerates into a hard and almost cartilaginous state, causing constant watering and inflammation of the eye, and rendering the snipping of it away still more necessary.

An œdematous state of the conjunctiva sometimes occurs more diffusedly, in old people of a relaxed habit of body. In one case, it came on in an old woman after an over-dose of rum punch, and continued for months. I have repeatedly seen it accompanied by an unnatural prominence of the eyeballs, as if they were pressed out by a swollen state of the orbital areolar tissue, or effusion into the ocular capsule. I have also met with subconjunctival œdema as an attendant on hemicrania and circumorbital neuralgia.

In the last-mentioned cases, the patients derived benefit from venesection, calomel with opium, and sarsaparilla. Leeches round the eye, mercurial purges, red precipitate salve to the eye, and temperance appeared useful in some of the other cases.

The conjunctiva is affected with an inflammatory œdema in many of the ophthalmiæ; in none so much as in that which arises from phlebitis. In cases of this kind, the membrane becomes in the course of a few hours greatly distended by a colourless effusion of fluid, apparently sero-gelatinous. This is attended with severe pain in the eye, and the speedy extinction of vision, as I shall have occasion to state more fully hereafter.

SECTION VIII. — PTERYGIUM.

Πτερύγιον, from πτερὸν, *wing*. *Syn.*—Unguis, *Celsus*. Web *of old English surgeons.* Onglet, *Fr.* Das Flügelfell, *Ger.*

Fig. Wardrop, Pl. III. *figs.* 2, 3. Beer, Vol. II. Pl. IV. *figs.* 4, 5. Ammon, Thl. I. Tab. I. *figs.* 12, 13, 14. Dalrymple, Pl. III. *fig.* 2.

The term *pterygium* is applied to a disease which consists chiefly in a thickened and elevated portion of the conjunctiva of the eyeball, of a triangular form, its base generally turned to the caruncula lacrymalis, while its apex, which is white and opaque, advances over the edge, or even as far as the middle of the cornea. In some cases, the base of the pterygium is towards the temporal angle, and occasionally both sides of the eye are affected with the disease.

Although pterygium, in most cases, affects the conjunctiva only, we sometimes observe a part of it evidently seated beneath that membrane. This deep-seated portion presents a glistening, tendinous appearance, especially towards the apex of the triangle, and probably belongs to the tunica tendinea.

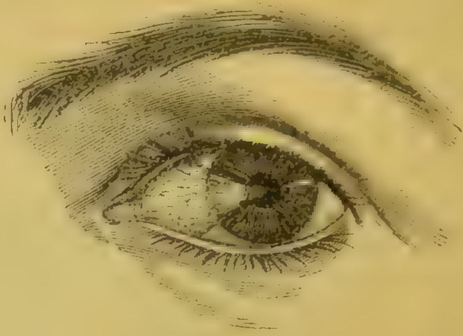

Fig. 32.

The form generally assumed by a pterygium is represented in *Fig.* 32., but occasionally the upper and lower edges of the thickened part are not straight, but run in a curved form towards the sinuses of the conjunctiva; and although the apex is, in general, narrow, yet we sometimes see the disease advance over the edge of the cornea, with a broad rather than a pointed extremity.

One variety of pterygium is semi-transparent, and thinly strewed with blood-vessels. This is the *pterygium tenue.* Another variety presents, from the size and course of its blood-vessels, almost the appearance of a thin muscle. This is the *pterygium crassum.* We can lay hold of each of these varieties with a pair of forceps, without much difficulty, and without giving the patient any pain, and raise it, not merely from the sclerotica, but sometimes even from the cornea. We can do this with greater ease, when the patient turns his eye towards the side whence the pterygium originates. A pterygium sometimes assumes a great degree of thickness, becomes fleshy, and rugous on its surface, and looks somewhat like a carcinomatous growth. If this occurs, as I have seen it do, at the nasal angle of each eye, its occurring on both sides removes the suspicion of its malignancy. This state of the pterygium is the result of chronic catarrhal ophthalmia, supervening on a common pterygium, and entirely neglected or improperly treated.

Pterygium sometimes proceeds even to its complete development without giving any pain, and even almost without any disagreeable feeling in the eye, so that the patient perhaps receives the first intimation of his disease from some other person, or from examining his eyes in a glass, or from the disease gaining that part of the cornea which is opposite to the pupil, and thereby obstructing vision.

The great number of pterygia which have their base turned towards the nasal angle of the eye, in comparison of the few which arise from any other part of the circumference of the eyeball, might naturally lead us to suspect that this disease consisted in an elongation of the semilunar fold of the conjunctiva, or that it took its origin from the caruncula lacrymalis; and on carefully examining a pterygium on the nasal side of the eye, it will appear evident, that the membrana semilunaris is generally involved in the disease. We have, however, the occasional occurrence of pterygium on the temporal, and even on the superior and inferior sides of the eye; whence it is evident that this disease is not always a prolongation of the semilunar membrane.

Pterygium on both sides of the same eye had occurred only twice to Beer. In these cases, they met in the centre of the cornea, and almost entirely deprived the patients of sight. In one case, Beer found three pterygia on the same eye. Mr. Wardrop mentions having seen two pterygia on each eye of the same individual.

Schmidt gives[1] an account and figure of an extraordinary pterygium, which so strongly resembled a muscle in its structure, that one might have almost believed the rectus superior oculi to have been misplaced. Taking its origin from behind the upper eyelid, it passed over the eyeball to the edge of the cornea, exactly in the form of a layer of muscular fibres. At the edge of the cornea, it became thicker and almost tendinous, and, opposite to the pupil, interwove itself with the cornea in the same manner as the straight muscles do with the sclerotica. This pterygium was successfully removed by operation.

Mr. Travers has represented[2] two cases of pterygium, each of which occupied the upper part of the eye. One of them was membranous and transparent, the other fleshy. The subject of the latter was a female, about 21 years of age, who had experienced repeated attacks of scrofulous ophthalmia, in one of which the cornea gave way, and the iris prolapsed near its ciliary margin. A pterygium then formed, originating from beneath the whole base of the upper eyelid; it was triangular, extended to the lower margin of the cornea, was of sarcomatous density, about a line thick, and formed a fold when the eye was directed upwards. It was completely cured by the operation of dividing and detaching it at its basis. The patient recovered her sight, and ultimately no vestige of the disease remained.

Such sarcomatous pterygia as those mentioned by Schmidt and Travers bear some resemblance to symblepharon, and the latter disease has sometimes been operated on, as if it had been a mere pterygium. The history of the disease, however, as well as the appearances of the eye, will readily enable the surgeon to discriminate between these two diseases. In symblepharon, a probe may often be passed behind the thickened fold of conjunctiva, never in pterygium. If what appears as a pterygium is not only sarcomatous, but is attended with more than ordinary pain, it may be suspected to be of a malignant nature.[3]

Causes. Beer scouts the idea adopted by many writers, that pterygium ought to be regarded as a consequence of ophthalmia. He grants that tedious or neglected ophthalmia, or ophthalmia treated with many relaxing external applications, is apt to leave the conjunctiva of the eyeball so loose, that on every motion of the eye, it falls into a number of folds, but asserts that such cases never appear to terminate in pterygium.

I have met with several cases, in which pterygium was combined with chronic catarrhal ophthalmia, and I am led to believe that the former disease had originated in the latter. I have also seen pterygium produced by scrofulous ophthalmia. In one case, I found a pterygium on the nasal side of each eye, in a person labouring under elephantiasis, who had been long in the West Indies. In two other individuals from the West Indies, I have met with pterygium on the nasal side of each eye. I have seen a particle of gunpowder, which had been lodged for years under the conjunctiva, at last cause pterygium. I have also known a cut of the edge of the upper eyelid and of the conjunctiva, and burns of the conjunctiva and of the edge of the cornea, by melted iron projected into the eye, to bring on this disease. In such cases, the pterygium is very tough, and adheres more closely to the cornea and sclerotica than in ordinary cases. In many cases, it is impossible to trace this disease to any exciting cause. Of this, however, I am certain, that often the disease begins by the formation of what ultimately forms its apex, close to the edge of the cornea, before any thickening or unnatural vascularity of the conjunctiva is observable.

Beer[4] came to the conclusion, that pterygium most frequently owed its origin to the influence of lime or fine stone-dust upon the conjunctiva, by far the greater number of patients who had been under his care with this complaint, being day-labourers, who are extremely exposed to this cause. Mr. Lawrence[5] has seen pterygium most frequently in persons who had lived long in hot climates, which agrees also with my experience. "Pterygium is so common," says Dr. Heineken[6], speaking of Madeira, "as almost to deserve the term endemic: at a very rough and faulty estimate of course, I should think that one-tenth of the peasants and boatmen were more or less effected with it; and although they never submit to an operation, and it in most instances encroaches greatly upon the cornea, yet I have never seen nor heard of a single case of blindness occasioned by it. Its prevalence may probably arise from those classes of men being especially exposed to the full and constant power of the sun, with no other covering for the head than a small cloth cap (*carapúça*), which does not give the slightest shade or protection to the eyes."

Prognosis. Pterygium rarely disappears of itself, and the duration of the cure is exceedingly various, depending on whether the operation be immediately submitted to by the patient, and be performed without leaving any part of the pterygium behind, or whether we content ourselves with alternate scarifications and stimulating applications, till the pterygium is removed by a tedious process of organic change of substance. If the cornea has become partially opaque from the presence of a pterygium, it may be long of clearing, or may never clear.

Mr. Raleigh relates[7] a case, in which a thick pterygium, occupying the nasal side of the eye, and encroaching about a line on the cornea, was entirely absorbed after the operation of extraction of the lens, the section being made on the temporal side of the cornea.

Treatment. I have found the solution of nitrate of silver useful in pterygium, even when the disease approached to the state styled *crassum*, especially when it was attended by catarrhal conjunctivitis. In several cases, I have known a cure effected by this means; as also, by vinum opii.

Should these means fail, it will, in general, be sufficient, in cases of *pterygium tenue*, not yet reaching to the cornea, to lay hold of the pterygium with a small pair of forceps, and snip a bit of it away. After this, it shrinks and disappears. In the mean time, the part may be touched daily with the vinous tincture of opium, or the red precipitate salve.

With regard to *pterygium crassum*, it has generally been thought, that the best plan is to remove it completely by operation. If the patient refuse to submit to this, we may try the effect of dividing the pterygium by two or three vertical scarifications, and then touching it daily with vinum opii. The probability, however, is, that the patient will tire of a mode of cure so tedious; and there is also a danger, that the pterygium, instead of disappearing, may become more luxuriant and extensive.

Mr. Wardrop describes[8], under the name of *fleshy pterygium*, what appears by his account to have been a common triangular pterygium, improperly treated by repeated scarifications, which, instead of causing its diminution, made it grow more rapidly, till at last it projected from between the eyelids, and involved the semilunar membrane and caruncula lacrymalis.

If it is thought advisable to proceed to the extirpation of the pterygium, it is to be performed in the following manner. The patient being laid on his back on a table, the assistant takes charge of both eyelids, separating them so as fully to expose the eyeball. The patient is to look outwards or inwards, according as the pterygium is on the nasal or temporal side of the eye, so as to put it on the stretch. With the toothed forceps, the operator seizes the pterygium about its middle, raises it from the sclerotica, and then snips off the fold thus formed, with a pair of curved scissors. Any remains of the pterygium are now to be laid hold of, and removed in the same way. Mr. Lawrence transfixes the pterygium with a knife, and then shaves it off as far as the edge of the cornea. On the following day, the whole surface of the wound is found in a state of superficial inflammation and suppuration. Cicatrization quickly follows, and the cure is generally completed in twelve or fourteen days.

The operation is very apt to be followed by the formation of fræna between the lids, especially the lower lid, and the eyeball. These impede the movements of the eye, and cause a feeling of dragging, much more irksome than any uneasiness usually caused by a pterygium; so that, on the whole, I am inclined to dissuade from the operation. At any rate, the extirpation must not be prolonged too much in the direction of the canthus.

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[1] Ophthalmologische Bibliothek von Himly and Schmidt; Vol. ii. p. 57; Jena, 1803.

[2] Synopsis of the Diseases of the Eye; Pl. vi. figs. 3 and 4. p. 424; London, 1820.

[3] See case of pterygium-like growth, ending in cancer, by Browne, Dublin Quarterly Journal of Medical Science, February, 1851, p. 226.

[4] Lehre von den Augenkrankheiten; Vol. ii. p. 638; Wien, 1817.

[5] Treatise on the Diseases of the Eye, p. 365; London, 1833.

[6] Medical Repository; Vol. xxii. p. 15; London, 1824.

[7] Transactions of the Medical and Physical Society of Calcutta; Vol. iv. p. 357; Calcutta, 1829.

[8] Morbid Anatomy of the Human Eye; Vol. i. p. 155; London, 1819.

SECTION IX. — PINGUECULA.

Fig. Beer, Vol. II. Pl. IV. *fig.* 6.

The little tumour called *pinguecula,* and sometimes *pterygium pingue,* appears to have its seat partly in the conjunctiva of the eyeball, partly in the areolar tissue connecting the conjunctiva to the sclerotica. It presents, in the greater number of cases, a small, yellowish, well defined elevation, situated close to the edge of the cornea, over which it very rarely advances, and never to such a degree as to interfere with vision. It is sometimes situated on the temporal, sometimes on the nasal, side of the eye. Weller assures us, that this little tubercle contains no fat. It seldom gives rise to any inconvenience. If it does, it is to be laid hold of with the toothed forceps, and removed with the scissors.

SECTION X. — WARTS OF THE CONJUNCTIVA.

Warts, red, fleshy, and somewhat granulated, single, or in clusters, are met with, growing from every part of the conjunctiva, not excepting the surface of the cornea. One begins to grow, perhaps, from the semilunar membrane, and others follow, till a large portion both of the palpebral and ocular conjunctiva is affected. Mr. Travers compares them to the warts which arise from the inside of the prepuce, and attributes their origin to a similar cause, namely, irritation from a diseased secretion. We generally find that they are attended by a puro-mucous inflammation of the conjunctiva.

I once saw a case, in which the removal of a small wart from the external surface of the lower eyelid was followed by a crop of warts on the conjunctiva of the eyeball. They disappeared spontaneously, but left partial symblepharon of both upper and lower eyelid. In another case I saw a wart, growing by a narrow neck from the conjunctiva scleroticæ, so large as to cover the eyeball, and presenting an appearance which might readily have been mistaken for fungus hæmatodes of the eye. By pressing the tumour aside, the sound cornea was brought into view, and on careful examination the root of the wart was found to be exterior to the sclerotica, and moveable on the eyeball. Conjunctival warts must not be confounded with the fungus which grows round a foreign body lodged in the conjunctival folds, nor with the fungous diseases of the conjunctiva afterwards to be described.

Although the progress of these excrescences is slow, they cause considerable irritation and inflammation, sometimes extending to the cornea, and ought therefore to be immediately removed with the scissors. Escharotics appear to have scarcely any power in diminishing their bulk, although they may perhaps delay their progress.

Mr. Wardrop has described a congenital warty excrescence of the corneal conjunctiva. He mentions that it was firm and immovable, with a rough granulated appearance externally, and, from its brownish colour, did not appear very vascular. It was small when first observed, and increased in size in proportion with the other parts of the body.[1] Mr. Bowman relates[2] a case of warty opacity of the cornea, its surface being rough, like that of a soft corn. By shaving it off, he reduced the prominence and improved the sight.

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[1] Morbid Anatomy of the Human Eye; Vol. i. p. 32; London, 1819. Two cases of a similar kind are figured by Mr. Wardrop; Vol. i. Pl. 4. figs. 1 and 2.

[2] Lectures on the parts concerned in the Operations on the Eye; p. 122; London, 1849.

SECTION XI. — POLYPUS OF THE CONJUNCTIVA.

Mr. Lawrence tells us[1], that he has seen small polypi, analogous to those of the Schneiderian membrane, growing from the conjunctiva. In one case, the tumour was as large as a pea, and was connected to the inner surface of the upper eyelid by a slender stalk. It had a smooth mucous surface. In snipping it off, Mr. L. found the peduncle hard, so as to require some force in dividing it. The tumour was found to be fibro-cartilaginous and hard internally, while externally it was formed of conjunctiva. The complaint had existed for 15 years, and had caused trichiasis of one quarter of the upper eyelid.

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[1] Treatise on the Diseases of the Eye, p. 366; London, 1835. For a similar case, see French Translation of this work, p. x.; Paris, 1844.

SECTION XII. — NÆVUS MATERNUS OF THE CONJUNCTIVA.

Fig. Ammon, Thl. III. Tab. VI. *fig.* 7.

It has already (p. 159) been noticed, that nævus sometimes implicates both surfaces of the eyelids. In other cases, the disease affects the conjunctiva alone, of which Ammon has recorded a remarkable instance.[1]

Early extirpation by the ligature seems the most likely plan of cure.

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[1] Zeitschrift für die Ophthalmologie; Vol. v. p. 84; Heidelberg, 1835.

SECTION XIII. — FUNGUS OF THE CONJUNCTIVA.

Sarcosis bulbi. Schwammichte Exophthalmie, *Ger.*

Fig. Ammon, Thl. II. Tab. I. *figs.* 5, 6, 7.

The conjunctiva is subject to two different fungous diseases, neither of which is a sequela of the specific diseases to which we appropriate the name of ophthalmiæ. The one has been described and figured by Beer, under the name of *exophthalmia fungosa.*[1] The other fungous state of the conjunctiva I have not found described by any author. Both are rare diseases.[2]

Symptoms. The *first* variety of fungus of the conjunctiva is of a deep red colour, inclining to livid; it affects chiefly the conjunctiva covering the sclerotica, over which it is elevated in irregular soft smooth masses; it sometimes rises from the inside of the lids, but never from the surface of the cornea. The fungus is pressed, however, by the eyelids, over the edge of the cornea, and sometimes to such a degree, as to hide it completely. Unattended by pain, this disease goes on increasing, till it projects from between the lids, and prevents them from closing. If neglected, it may reach to a great size, and is liable to be confounded with the last stage of spongoid tumour of the eyeball. By exposure to the influence of the air, the secretion from the surface of the fungus becomes encrusted, while the irritation of the foreign substances which come into contact with it, renders it tender, and apt to bleed. The edge of the fungous growth sometimes becomes affected with ulceration, presenting a white sloughy appearance, and in this way portions of it are apt to perish. The disease is a very slow one, and the subjects of it are of a decidedly scrofulous habit. For a time, the firmness of the cornea and sclerotica is sufficient to resist the effects of the pressure of the fungous mass by which they are surrounded, and which makes way for itself chiefly by projecting and dilating the eyelids; but at length the eyeball begins to suffer from the pressure, inflames, and bursts, or the ulcerative process spreads from the fungus to the sclerotica, and destroys the eye.

The *second* variety of fungus of the conjunctiva is almost of a gelatinous consistence, and of a light yellow or brownish colour; it is met with chiefly on the inside of the lids, especially of the upper, and in the superior fold of the conjunctiva. It sometimes attains a very considerable size; and although soft, and destitute of red vessels, is apt to prove destructive, by the pressure which it exercises on the eyeball.

On the supposition of neither of these fungous affections of the conjunctiva being malignant, it is evident that, by their mere mechanical effects, they may prove destructive, not only of vision, but of life. Even after the eyeball has been destroyed by their pressure, they may go on to increase, affect the bones of the orbit, and wear out the patient by pain and fever. I have sometimes been led to doubt whether the second variety was not cancerous.[3] The exuberant growth and loose textures of the fungous mass sufficiently distinguish it from epithelial cancer of the conjunctiva, in which the membrane becomes warty, the eyelid thickens and inflames, and the part at length ulcerates.

Treatment. In the early stage of the fungous diseases of the conjunctiva above described, leeches to the conjunctiva would probably be useful; and benefit might perhaps be derived from the application of the vinous tincture of opium, or of gentle astringents in solution. At a later period, escharotics are naturally thought of, especially the solid nitras argenti. In a case of the first variety, which has been for years under my observation, benefit appears to have been derived from the internal use of cod-liver oil. Should the disease still advance, extirpation of the fungus ought not to be delayed; and in both varieties, it will be found of advantage to commence the operation by separating the eyelids at their temporal angle, by an incision carried towards the temple, so as to allow the whole of the diseased conjunctiva to be exposed to view. The extirpation will now be accomplished with comparative ease, by means of the toothed forceps and a small scalpel, with the occasional aid of the scissors. The first variety of fungus, when we attempt to dissect it from the sclerotica, bleeds profusely, so that the assistant must be prepared to clear away the blood as the operator proceeds, by injecting cold water over the eye. After the whole of the fungus is removed, the eyelids, where they have been disunited, are to be brought together with a stitch. The surface exposed by the removal of the disease will, in a day or two, be covered with purulent matter, and slowly become invested by a pseudo-conjunctiva. Any tendency to reproduction must be prevented by the use of nitras argenti, and symblepharon guarded against by frequent motion of the eye, and the introduction of a little mild salve into the folds of the conjunctiva.[4]

When fungus of the conjunctiva has been allowed to proceed in its course till the eyeball is destroyed by its pressure, it will be difficult to remove the fungous growth by itself, and it is quite unnecessary to attempt to do so. In such cases, we must have recourse to extirpation of the eyeball, taking care also to remove any part of the fungus arising from the inside of the eyelids.

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[1] Lehre von den Augenkrankheiten; Vol. ii. pp. 223, xxx.; Pl. ii. fig. 6; Wien, 1817.

[2] See two cases by Scarpa, in his Trattato delle principali Malattie degli Occhi; Vol. ii. p. 303; Pavia, 1816.

[3] Canstatt über Markschwamm des Auges und amaurotisches Katzenauge, p. 11; Würzburg, 1831.

[4] See case of vascular excrescence of the conjunctiva, extirpated by Mr. Lawrence, Lancet, January 26, 1850, p. 126. The excrescence is said to have been malignant. Case by Rau, Jones' Ophthalmic Medicine and Surgery, p. 459; London, 1847.

SECTION XIV. — CONJUNCTIVAL AND SUBCONJUNCTIVAL TUMOURS.

Various tumours take their origin in the conjunctiva, or in the areolar tissue which connects it to the neighbouring parts. Some of them are congenital, others arise in after-life.

1. The annexed figure represents a case described[1] by Professor Gräfe, under the name of *trichosis bulbi.* I extirpated a tumour of the same appearance, and exactly in the same situation. It was firm and white, and had a number of fine hairs growing from it, like a mole. It had long kept up an inflamed state of the conjunctiva, which entirely subsided after the tumour was removed. It was so incorporated with the sclerotica, that its root was left, but died away under the use of nitrate of silver solution. In a girl who applied at the Glasgow Eye Infirmary, there was a fixed trichosis at the inner margin of the cornea, and a moveable tumour at the outer commissure. Mr. White Cooper records a case of trichosis both at the nasal and temporal edge of the cornea.[2] A fatty tumour, which I extirpated from a young lady's eye, had one hair growing from it. On the same side, she had pendulous congenital tumours on the auricle.

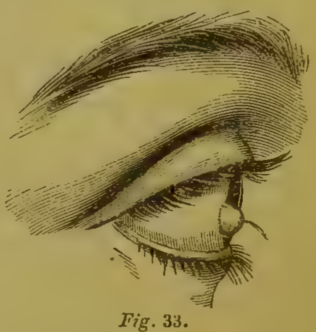

Fig. 33.

Mr. Wardrop has described and figured a tumour, about the bulk of a horse-bean, of which a small part seemed to grow from the cornea, while the rest was situated on the sclerotica, next the temporal angle of the eye. Its surface was smooth, and covered by the conjunctiva. Upwards of twelve very long and strong hairs grew from its middle, passed through between the eyelids, and hung over the cheek. The patient, at this time upwards of 50 years old, remarked that these hairs did not appear until he had advanced to his sixteenth year, at which time also his beard grew.[3]

2. We sometimes meet with gelatinous-like tumours, clear and transparent; and small, very hard, vesicular tumours, attached to the conjunctiva. They are to be snipped off.

Case 173. — Mr. Wharton Jones communicated to me the case of a patient, who came to him with a small vesicular tumour under the conjunctiva, between the semilunar fold and the inner margin of the cornea. It could be made to slide in the subconjunctival areolar tissue. With a fine forceps, Mr. Jones raised a fold of the conjunctiva over the tumour, and snipped it across with scissors; whereupon the vesicle slipped out, and was received on the edge of the lower lid. On placing it on the palm of his hand, and examining it, he found it egg-shaped; with a long diameter of about two lines, whitish like a hydatid, but without any head. On minute examination, he found its tissue not the same as that of a hydatid. Its wall was composed of a finely granulous membrane; its contents, a fluid with flat nucleated cells, like epithelium cells, some free, some aggregated together in a membranous form.

Cysticerci and other entozoa, as I shall hereafter have occasion to state, are sometimes met with under the conjunctiva.

3. Other conjunctival or subconjunctival tumours are adipose, sarcomatous, or even cartilaginous, and, in most cases, are easily extirpated, for, in general, they are but loosely attached to the sclerotica.

In some individuals, a fatty deposition forms beneath the conjunctiva at the inner canthus, stretching upwards behind the upper eyelid, and attended with an amplification of the semilunar fold. The bulk of the deposition is seldom such as to demand any operation.

A not uncommon situation for fatty growths is behind the upper fold of the conjunctiva towards the temple, or between the rectus externus and the lacrymal gland. I have removed a congenital fatty tumour from this situation, drawing it outwards with forceps, and snipping it away with scissors.

4. I have seen several cases of what seemed scrofulous tubercles, growing from the sclerotica, and elevating the conjunctiva. Such tumours are of a whitish or yellowish colour; they appear as if about to suppurate, but continue firm, slowly increase to perhaps the size of a hazel-nut, burst through the conjunctiva, but do not come to suppuration. In one case, a child presented a tubercle imbedded in the cheek, similar to the one growing from the eye. Dr. A. Anderson was so kind as to examine for me microscopically, a portion of a growth of this sort, taken from the eye. He found it slightly nodular, or faintly lobulated externally. Its texture did not break short, but tore up under the needles, and was distinctly fibrous. The fibres were very fine, not very intricately interwoven, and could easily be separated into bundles, in which they ran parallel to one another. They were loaded with minute cells, which separated on breaking up the mass in a drop of water. They are probably similar growths, which, contained within the eye, constitute what I shall describe in a subsequent Chapter as non-malignant tumours. Such cases, left to themselves, are apt to end in disorganization and atrophy of the eyeball. If extirpation is attempted, the diseased mass is found to be soft and easily torn.

5. Müller makes mention of a tumour of the conjunctiva palpebrarum, as large as the fist. It was made up almost entirely of cau-

date corpuscles, arranged in a fibrous manner. The growth was lobulated; it could be broken, and presented a fibrous fracture, fasciculi appearing to radiate towards the periphery from one common centre. He regards it as belonging to the category of benignant albuminous sarcoma. It was extirpated thrice, but returned after each operation, having been cut into rather than excised. After having been extirpated for the last time, on which occasion the eye was also removed, it ceased to return, and the patient recovered completely. It proceeded entirely from the conjunctiva, the globe of the eye being perfectly sound.[4]

6. Mr. Abernethy refers[5] to a curious case, published in London, by Dr. Bouttatz, of Moscow, of a tumour which grew beneath the conjunctiva, and pushed it out from between the eyelids. It was seven inches long, and three inches and a half in circumference; and, on extirpation, weighed two pounds and a half. The structure, Mr. Abernethy considers to have answered correctly to what he has denominated pancreatic sarcoma. It had also the ordinary characters of that diseased structure, which are those of slowly and regularly increasing, not being prone to inflammation, nor tending to suppuration. The tumour was closely connected with the conjunctiva, against which it pressed, but did not involve the cornea, which still retained its natural transparency.

7. Not only is the palpebral conjunctiva subject to cancerous ulceration (see p. 134), but we meet with cancerous tumours growing over the sclerotica.

Case 174.—I was consulted by a man, aged 50, on account of a tumour, about the size of a small bean, growing midway between the external canthus and the junction of the sclerotic with the cornea. It was of a bright red colour, and had a smooth, glistening, lobulated surface. It had been repeatedly extirpated, but always grew again. I advised extirpation of the eyeball, which, I understand, was performed by Mr. Syme.[6]

8. Melanosis not unfrequently commences in or under the conjunctiva. We see small melanotic depositions at the edge of the cornea. In other cases, a pendulous mass hangs from the conjunctiva.

Case 175.—In a case of this kind, in a patient of the Glasgow Eye Infirmary, a melanotic tumour protruded at the inner canthus, and elevated the upper eyelid. It grew by a pedicle, and was about the size of half a small filbert. It was snipped off, grew again, and was again snipped off. Ultimately, it spread extensively over the eyeball, and so affected even its interior, that the organ required to be extirpated.

Case 176.—Mr. Travers relates the case of a lady, in whom the cornea was concealed by a tumour, of a dark purple colour, protruding to such an extent between the eyelids, as to occasion great inconvenience and deformity. It had the appearance of being disposed in lobes, somewhat resembling a bunch of currants, of unequal size. Mr. Travers extirpated, in this case, the anterior hemisphere of the eyeball. On examination of the tumour, the cornea and sclerotica proved to be entire, and the morbid growth, lying upon and adhering to the cornea and a small portion of the sclerotica, had acquired the lobulated appearance, as if by degeneration of the investing conjunctiva. Delicate white bands, the only vestiges of this membrane, were seen intersecting the lobules at irregular distances, in the form of septa. The substance, on dissection, was found to be partly firm, partly pulpy, of a dark colour, here and there mottled with white, and measured a quarter of an inch in thickness from the external surface of the cornea.[7]

Had Mr. Travers been aware of the external seat of this tumour, perhaps he might have endeavoured to extirpate it without sacrificing any part of the eyeball. In the explanation of the two figures which he has given of the tumour, he tells us that when he first saw the case, he formed the idea that it was a fungus originating from the iris or choroid, consequent to a slough of the cornea. The patient recovered quickly from the operation, and the remaining part of the eyeball collapsed. From the dark colour and partly pulpy consistence of the morbid growth, may we not suspect it to have been of the nature of melanosis? Mr. Travers mentions that the surface of the cornea was rough, and had a brownish tint, as if beginning to degenerate into the morbid mass which lay above it.

The figure which Mr. Travers has given of the external appearance of the tumour is very similar to the eye of a gentleman by whom I was consulted some years ago, and who submitted by my advice to have the anterior half of the eyeball extirpated, as in Mr. Travers' case. Dr. Monteath being consulted, approved of and performed the proposed operation; but on examining the portion of the eye which was removed, we found the melanotic degeneration to occupy the whole place of the vitreous humour, so that the rest of the eye was immediately extirpated. Recovery was speedy, and I heard of no return of the disease.

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[1] Journal der Chirurgie und Augenheilkunde; Vol iv. p. 137; Berlin, 1822. See Ruppius, in Ammon's Zeitschrift für die Ophthalmologie; Vol. ii. p. 345; Dresden, 1831: Jones' Ophthalmic Medicine and Surgery, p. 458. fig. 82; London, 1847.

[2] Medical Gazette; Vol. xxix. p. 278; London, 1841.

[3] Morbid Anatomy of the Human Eye; Vol. i. p. 32; London, 1819.

[4] Müller on the Nature of Cancer, translated by West, p. 19; Pl. iv. fig. 10; London, 1840.

[5] Surgical Observations on Tumours, &c. p. 43; London, 1811: Bouttatz, Observations pratiques sur différentes Maladies, p. 1; Londres, 1801. Burgmann and Blumenbach have each described a case of extraordinary *prolapsus conjunctivæ*, observed by the former in the head of a man who was hanged, and by the latter in that of a man who was beheaded. Some analogy has been supposed to exist between Bouttatz's case and the prolapsus conjunctivæ in these two instances. See Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 411; Dresden, 1831.

[6] Dobie, Monthly Journal of Medical Science, Oct. 1853, p. 309, where figures are given of the eye, and of the cancer cells of the tumour.

[7] Synopsis of the Diseases of the Eye, pp. 102. 394; London, 1820.

CHAPTER V.

DISEASES OF THE SEMILUNAR MEMBRANE, AND CARUNCULA LACRYMALIS.

SECTION I. — INFLAMMATION OF THE SEMILUNAR MEMBRANE AND CARUNCULA LACRYMALIS.

Symptoms. The semilunar membrane and caruncula lacrymalis, when inflamed, become much enlarged, of a bright red colour, and affected with considerable pain, especially when the lids are moved. The inflammation extends in some degree to the conjunctiva, of which, indeed, the semilunar membrane is a portion, and by which the caruncula is invested. A sensation as if some foreign body was lodged in the inner angle of the eye attends the disease, the absorption of the tears is obstructed, and an increased secretion of mucus, sometimes puriform, flows from the Meibomian follicles, conjunctiva, and caruncula. In some cases, suppuration takes place in the substance, perhaps in the follicles, of the caruncula, the redness and swelling increasing for a time, till matter forms, when the swelling points, breaks, and discharges itself. Fungous excrescences are apt to follow, and sometimes a permanent distortion of the caruncula; while in other instances, this part is entirely destroyed by the suppuration.

Causes. The influence of cold may cause the inflammation. I had an instance of this in a patient who caught cold while recovering from dysentery. Slight injuries may also induce this disease. Foreign bodies, such as a particle of iron, lodging behind the semilunar membrane, or so fixed as to irritate the caruncula, may also be the cause. A little girl was brought to me, with an inflammatory enlargement of the caruncle, which had been observed for some weeks, and was still increasing. By the side of the swelling, between it and the eyeball, I noticed something like a white thread, which I pushed out with my finger. It was an awn of barley, ¾ inch long. Dr. Monteath mentions[1] his having seen this disease in two instances, produced by a loose eyelash, the root or thick end of which had fairly entered the upper punctum and lacrymal canal; its other extremity consequently pointed downwards to the caruncula, which it constantly irritated. The troublesome irritation, which had been excited in both instances, immediately subsided on removing the eyelash from the lacrymal canal. This little accident I have met with in a number of instances; in some of which, the eyelash was in the lower punctum, and in others in the upper. In one case, the patient, with the view of relieving the uneasiness which he felt, had made the eyelash be cut across with a pair of scissors, which only served to fret the caruncle the more. I have also seen an eyelash sticking in one of the Meibomian apertures, and fretting the eye. From the smallness of the aperture, this occurs much more rarely.

Prognosis. Inflammation of the semilunar membrane, and caruncula lacrymalis, if neglected, may give rise to watery eye, and ultimately to inflammation of the lacrymal passages.

Treatment. The removal of the cause when that is known and removable, bathing the parts frequently with tepid water, touching them once a day with the lunar caustic solution, and the use of laxatives, make up the general treatment. Should the swelling go on increasing, a leech may with propriety be applied to the inflamed caruncula; and if suppuration threatens, a bread and water poultice, in a thin linen bag, is to be laid over the inner angle of the eye. The suppurated caruncula is to be opened with the lancet. Should it threaten to throw out fungous granulations, we must endeavour to repress them by the vinous tincture of opium, or the application of sulphas cupri, or nitras argenti. If these means are insufficient, the fungus must be removed with the scissors.

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[1] Translation of Weller's Manual; Vol. i. p. 191; Glasgow, 1821.

SECTION II. — POLYPUS OF THE CARUNCULA LACRYMALIS.

I have repeatedly seen a soft red tumour growing by a pedicle from the caruncula, and bleeding profusely on being touched. On laying hold of it, the greater part of it comes away in the grasp of the forceps, and looks exactly like the soft polypus of the Schneiderian membrane. In other cases, I have met with a firmer sort of polypus, springing from the semilunar fold and surface of the caruncula, of a granular or lobulated structure, and requiring to be snipped away. Both varieties are apt to be reproduced. Their root should be touched from time to time with nitrate of silver, sulphate of copper, or a saturated solution of carbonate of soda.

SECTION III. — NÆVUS MATERNUS OF THE CARUNCULA LACRYMALIS.

Ammon represents[1] a case of telangiectasia of the caruncula, connecting itself with the lower lid, covering almost the whole eye, and hanging down almost to the mouth.

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[1] Klinische Darstellungen des Krankheiten des menschlichen Auges; Vol. ii Tab. ix. fig. 10; Berlin, 1838.

SECTION IV. — ENCANTHIS.

Fig. Demours, Pl. LXIV. *fig.* 1. Ammon, Thl. II. Tab. IX. *figs.* 6, 7, 8, 9.

This term is applied to a chronic enlargement of the caruncula lacrymalis and semilunar membrane, but especially of the former. Encanthis *benigna* has been distinguished from encanthis *maligna*; the former, a merely hypertrophied state of the parts, and probably of the conjunctiva more than of the caruncula, the effect of simple inflammation, and disappearing under the use of the remedies already enumerated; the latter, a scirrhous affection of the glandular substance of the caruncula, degenerating, if neglected, into cancerous ulceration.

Symptoms. In scirrhous encanthis, the caruncula presents the appearance of a hard, irregular swelling. It involves the semilunar fold, and extends to the conjunctiva lining the lids, and even to the sclerotica and cornea. It is at first of a uniform red colour; but after it has attained a considerable bulk beyond the natural size of the caruncula, it becomes here and there of a whitish colour, with varicose vessels ramifying over its surface. It is the seat of lancinating pain. It impedes, by its size, the functions of the eyelids and excreting lacrymal passages. The lids, especially the lower, are everted and excoriated. The hairs growing from the caruncula become much stronger than natural. Its surface is easily excited to bleed. At last it ulcerates, the edges of the sore become everted, and the discharge is thin and acrid, irritating and excoriating the neighbouring parts. If allowed still to proceed in its course, the cancerous ulceration spreads to the lids, lays open the lacrymal passages, attacks even the eyeball, and in fact runs a course similar to that of cancer of the lids, as already described.

Treatment. The scirrhous encanthis requires to be extirpated. For this purpose a curved needle, armed with a linen thread, is to be passed through the tumour, by means of which it may be drawn out from the neighbouring parts, while, with a small scalpel or the scissors, it is completely separated from its connections. It is probable, that the removal of the caruncula and semilunar fold, will be followed by incurable stillicidium lacrymarum; but even if this should happen, it is not to be compared with the dangers attending a scirrhous, or cancerous affection of these parts, left to itself. If the lids, or the eyeball, are involved, these parts must be removed. If the operation is followed by granulations of an exuberant or unhealthy character, they must be touched with the nitrate of silver.[1]

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[1] On Encanthis, consult Carron du Villards, Guide Pratique; Tome i. p. 454; Paris, 1838. For cases of Extirpation, see Purmann's Chirurgia Curiosa, translated by Sprengell, p. 59; London, 1706: Bouchacourt, Revue Médicale, Avril 1842, p. 6.

SECTION V. — LITHIASIS OF THE CARUNCULA LACRYMALIS.

Under this title, Himly[1] refers to Blasius, Sandifort, Schmucker, and Riberi, for cases of concretions lodged in the cryptæ of the caruncula. They are to be picked out with a needle.

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[1] Die Krankheiten und Missbildungen des menschlichen Auges, Vol. i. p. 266; Berlin, 1843.

CHAPTER VI.

DISEASES OF THE EXCRETING LACRYMAL ORGANS.

SECTION I.—INJURIES OF THE EXCRETING LACRYMAL ORGANS.

§ 1. *Injuries of the Puncta and Lacrymal Canals.*

In the 1st Section of Chapter III., I have spoken of the obliteration of the puncta by burns. The intrusion of loose eyelashes into the puncta, has been mentioned in the 1st Section of Chapter V.

If the canals which lead from the puncta lacrymalia to the lacrymal sac are injured, it becomes a question, how far the eyelids are likely to be distorted, and the integrity of the canals destroyed, by the cicatrice which follows, or the suppurative inflammation which is to be dreaded. When the wound has been occasioned by a clean cutting instrument, we may hope for a cure, without either distortion of the eyelids or permanent interruption of the function of the canals. When the part is torn or bruised, it may be destroyed by the consequent inflammation and suppuration; and if both canals are included in the injury, an irremediable stillicidium, or discharge of tears and mucus, from the nasal angle of the eye, seems likely to ensue.

In lacerated wounds, then, our prognosis must be doubtful. Yet even such wounds are sometimes happily cured. Schmidt relates[1] the case of a person, who, in a game at blindman's buff, was laid hold of by the finger of one of the party, exactly in the nasal angle of the eye, and had the under eyelid torn away to the length of half an inch from the upper. Mohrenheim, who happened to be in the company, pronounced an unfavourable prognosis; but by Schmidt's care the case was cured in eight days, without the slightest stillicidium or ectropium. He omits, however, to mention whether he sounded the lower canal with Anel's probe after the cure, so as to ascertain that it was patent. In a drunken brawl, a man met with an injury exactly similar to what Schmidt describes, and for which he applied at the Glasgow Eye Infirmary. The wound healed after a good deal of trouble to keep the lid in its place, left very little deformity, and no stillicidium. I thought it very unlikely, from the nature and situation of the injury, that the lower canal could have continued patent, and on passing Anel's probe, I found it totally closed about the middle of its course. In case 135 (p. 141), both canals were totally removed in an operation for cancer, and yet no stillicidium ensued. Either little lacrymal secretion is formed in such cases, the conjunctiva absorbs more of it than it does in general, or it is more readily dissolved in the air. The observations of Gunz and Zinn, indeed, would lead us to suppose, that, besides the two canals, there are other smaller channels from the conjunctiva into the lacrymal sac.[2]

In cases of wounds of the canals, our object is to bring the separated parts into apposition, and then to keep them so. This is best effected by the introduction of a stitch, and the application of slips of plaister supported by a compress and roller. The patient must be careful to keep the eyes at rest, till the wound is perfectly united. It might perhaps aid us in procuring a perfect union, to pass a bristle by the punctum, through the divided canal, and through the lacrymal sac into the nasal duct, and keep it there till the wound heals.

If the wounded canal does not unite, but each end cicatrizes separately, little is to be hoped from making raw the edges of the wound, and again trying to bring them together with greater accuracy. "I have met with several such cases," says Mr. Travers, "and have tried in vain to heal them."[3]

I saw a boy at the Glasgow Eye Infirmary, in whom a wound, received eight years before, had divided each lacrymal canal, about the fifth of an inch from the puncta. The openings, thus produced, nearest to the puncta, remained patent, while those next the lacrymal sac had completely closed. A troublesome stillicidium lacrymarum was the result. There was an anchyloblepharon, also, at the inner angle of the eye.

§ 2. *Injuries of the Lacrymal Sac.*

The lacrymal sac is pretty well protected from injury. It is occasionally, however, laid open both by incised and lacerated wounds. These must be treated with care, lest they degenerate into fistulæ of the sac. If the wound is extensive, and perhaps the tendon of the orbicularis divided, a stitch or two will be necessary. Should the opening into the sac contract to a small size, and its edges threaten to become callous, they should be touched with lunar caustic, or a red hot wire. The introduction of a style will only give temporary relief, by conveying the tears into the nostril.

Case 177.—A female applied at the Glasgow Eye Infirmary, in whom the sac had been laid open by a stroke with the sharp end of a shuttle, thrown out suddenly from a steam-loom. Two stitches had been immediately used, but the wound had not healed. Tears flowed from it, on pressing the upper part of the sac.

A blow over the sac will sometimes rupture it, without the skin being divided, and emphysema of the eyelids will ensue, on blowing the nose.

Lacerated and gunshot wounds, implicating the sac, are followed by great swelling of the eyelids, and are apt to end in sloughing. Care must be taken to obviate ectropium in such cases.

§ 3. *Injuries of the Nasal Duct.*

Injuries of the membranous nasal duct must happen not unfrequently in operations for the relief of dacryocystitis and fistula lacrymalis, especially in passing probes and other instruments through the duct, either from above or from below. Attempts to open a passage for the tears by a series of probes, entered by the puncta, must often be attended by laceration and penetration of the walls of the duct. Even in introducing a style, there is reason to believe that it is often pushed, not in the calibre, but through the sides of the duct, into contact with the periosteum or the bone, causing hæmorrhagy from the nostril. Such injuries must often prevent the success of operations for the cure of dacryocystitis, or bring about a relapse.

The osseous canal, through which the duct passes, is sometimes shattered, and its sides pressed in by severe blows on the face. I once saw a case, in which this had followed a kick from a horse, received on the side of the nose. The consequence was complete obliteration of the passage for the tears, from the lacrymal sac. The lacrymal canals and the sac, being uninjured, served to collect the tears, which, having no exit, caused frequent inflammations of the sac, which ended in abscesses, bursting through the skin. The patient was admitted into the Glasgow Eye Infirmary, under the care of the late Dr. Monteath, who, as he found it impossible to effect any new passage for the tears, not even through the os unguis, attempted by caustics of various kinds, and even by the actual cautery, to obliterate the sac and canaliculi, but without success. Under such circumstances, by cutting across the canaliculi, the tears might be prevented from reaching the sac.

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[1] Ueber die Krankheiten des Thränenorgans, p. 215; Wien, 1803.

[2] Zinn, Descriptio Anatomica Oculi Humani, p. 233; Gœttingæ, 1780.

[3] Synopsis of the Diseases of the Eye, p. 238; London, 1820.

Dr. Rognetta suggests[4] that in every case of fracture of the nose, in which there is reason to dread closure of the nasal duct, we should sound the duct from the inferior aperture, with the probe of Laforest, improved by Gensoul, and leave it in the duct for at least a day.

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[4] Traité Philosophique et Clinique d'Ophthalmologie, p. 125; Paris, 1844.

SECTION II.—ACUTE INFLAMMATION OF THE EXCRETING LACRYMAL ORGANS.

Syn. — Dacryocystitis acuta.

Fig. Ammon, Thl. II. Tab. VIII. *fig.* 9.

Symptoms. There is a circumscribed swelling in the situation of the lacrymal sac, hard, very sensible to the touch, and accompanied by a feeling of obtuse, deep-seated pain, extending to the nose and to the eye. This swelling gradually becomes red, and the least touch is insupportable. The papillæ are shrunk, the puncta scarcely visible, the absorption and conveyance of the tears into the lacrymal sac, and through the nasal duct into the nose, completely stopped, and a stillicidium lacrymarum is present. The nostril on the affected side is at first uncommonly moist; but it soon becomes dry, the inflammation extending to the mucous membrane of the nostril. A degree of sympathetic inflammation affects the caruncula lacrymalis, the conjunctiva, and the eyelids. The redness about the nasal angle of the eye, extending with some degree of swelling even to the cheek, gives to the parts, when viewed at a distance, an appearance as if the integuments were attacked by erysipelas; but on a nearer examination, the characteristics of phlegmonous inflammation are recognised, and in the midst of the diffused discoloration and tumefaction, the circumscribed swelling of the lacrymal sac is evident, not merely to the touch, but even to the view.

The primary and chief seat of this disease is the mucous membrane of the whole of the lacrymal passages, from the puncta to the nose. When the stage of pure inflammation has reached its highest degree, and is about to pass into the suppurative stage, the mucous membrane of the lacrymal canals and nasal duct becomes so much swollen, that these tubes cease to be pervious. The tumefaction extends also to the parietes of the sac. The nasal duct, being enclosed in an osseous canal, cannot become tumefied by inflammation, and at the same time leave a free passage to the tears. The anterior side of the sac, on the other hand, being covered only by soft parts, is gradually distended, so as to form the tumour already mentioned, which becomes much more considerable when the disease is so far advanced that the mucus secreted is of an inordinate quantity, and puriform. The pressure from within the sac produces progressive absorption, so that the matter comes gradually towards the surface, while the thickening of the mucous membrane behind serves to secure the deeper-seated parts. Mr. Hunter has repeatedly referred[1] to the fact of the matter within the sac not following the shortest way, which would be directly into the nose, but coming to the external surface, as an illustration of the instinctive provision which exists in the body for bringing extraneous and morbid substances to the skin for their exit. Occasionally, however, the means of protection becomes a cause of future evil, for there sometimes takes place such a change in the texture of the parietes of the canals, sac, and duct, that they can scarcely ever return to their natural state; but one or more of these parts are, in a greater or less extent, constricted, or even obliterated.

Towards the end of the inflammatory stage, the patient complains of headache, and has other symptoms of febrile disturbance of the constitution. The pain in the parts primarily affected is often very severe, in consequence, no doubt, of the unyielding nature of the surrounding structures. The whole head suffers, and the fever is not unfrequently attended with delirium during the night.

As happens with all mucous membranes in a state of inflammation, a very abundant morbid secretion of mucus takes place at the transition of the first into the second stage. This fluid collects in such a quantity within the lacrymal sac, that the tumour is strikingly increased in size, and is felt distinctly to fluctuate. The accumulated mucus cannot escape in any considerable quantity from the sac into the nose, on account of the swollen state of the lining membrane of the nasal duct. From the same cause, the accumulated mucus cannot be regurgitated through the lacrymal canals. Besides, though the tears are more plentifully secreted than during health, they are not absorbed and conveyed into the sac, where they might have the effect of diluting this morbid mucous secretion.

It rarely happens, after the sac is once filled with muco-purulent fluid, that the symptoms begin to subside, without the skin giving way. If they do, a discharge of matter takes place from the puncta, the swelling falls, and the passage into the nose becomes patent. In general, the tumour increases, the redness becomes darker, the skin more glistening, the fluctuation more distinct. The sac, and the parts by which it is covered, altered by inflammation, are incapable of any further distension. The skin sometimes mortifies and sloughs; but more commonly in the middle of the swelling, a yellowish, soft point is observed, generally below the tendon of the orbicularis, but in some rare cases above it, and which soon gives way. The collection of puriform mucus, left to itself, works a passage through the orbicularis palpebrarum, and through the integuments; but by this opening, the thinner parts merely of the puriform secretion will be discharged, and the tumour will, at least for some time, be but inconsiderably diminished.

By and by, we observe, when we press upon the superior part of the sac, that it is not altogether puriform mucus which is discharged by the opening, but occasionally a quantity of pure tears, a proof that the action of the puncta and canaliculi is re-established. After a time, the puriform discharge ceases, and healthy mucus comes to be secreted. It is in general transparent, although for a while it may present occasional streaks of a white colour. These at last entirely disappear, and the mucus becomes thinner in consequence of a due intermixture of tears. The opening of the sac now heals either spontaneously, or by the assistance of art. Most frequently it begins with contracting to a small aperture, by which, if the nasal duct has not returned to its natural dilatation, tears and mucus are discharged. Should this opening close, and the duct still continue impervious, the patient is obliged several times in the day to press upon the sac, that the mucus and tears which it contains may be discharged through the puncta.

Causes. Among the causes of this disease, exposure to cold, and contusions on the side of the nose, are those most frequently noticed by patients. I have known long-continued weeping bring on acute dacryocystitis, when there appeared no predisposition to the disease Beer mentions the case of a child of four years old, in whom it arose from the irritation of a large pea, which had been thrust so deep into one of the nostrils that it was with difficulty extracted.[2]

Prognosis. In every instance, this is a sudden and rapid disease, terminating its course in 10 or 12 days. The prognosis is always more favourable than in the chronic affection of the same sort, which has probably been long preceded by imperfect transmission of the tears into the nose.

When this disease arises from no considerable injury of the sac, but from some slight, perhaps unknown cause, the prognosis is very favourable during the first stage; that is, before the secretion of puriform mucus has commenced. If the disease has reached the suppurative stage, we have to contend indeed with a blenorrhœa, or morbid secretion and accumulation of mucus; but under proper treatment these symptoms may disappear. When the inflammation is from the beginning severe, or the case has been neglected or mistreated, the nasal duct and lacrymal canals run the risk of obliteration; and it is to be accounted fortunate if the duct is obliterated at its lower extremity only, or the canals merely at their termination in the sac. The whole length of the duct may be converted into a ligamentous, almost cartilaginous substance, which baffles every attempt again to render it pervious; and in this case, both the lacrymal canals and the sac itself may become obliterated. The possibility of such events must be borne in mind, when we are called in even during the first stage.

The prognosis during the second or suppurative stage is extremely dubious. No surgeon, however great his experience, can know how far, during the first stage, the permeability of the canals has been affected; nor can he at this period attempt to ascertain by probes the state of the parts, without exposing them to essential injury. If we are called in just as the suppuration has commenced, our treatment may perhaps moderate that process; and, at least, we have it in our power to open the sac at the proper time, and in the proper place. If we are later, we probably have a fistula to contend with.

Treatment. It is by combating the inflammation that we are to cure this disease, and not by attacking merely one, or even several of the symptoms. Dilatation, for instance, by the introduction of probes through the canaliculi into the sac, and down even into the nose, would only be subjecting the inflamed parts to a new cause of irritation, and might thus produce effects which would render a complete cure difficult, if not impossible.

The method of treatment, before the process of suppuration has commenced, is sufficiently simple. In mild cases, it consists in observing the antiphlogistic regimen, and in carefully applying to the inflamed parts a piece of folded linen, moistened with an evaporating lotion. In severe cases, bleeding at the arm, immediately followed by the application of leeches over the swelling, or to the mucous membrane of the nostril, ought to be employed. The bowels are to be freely opened, and a gentle degree of perspiration maintained by the use of some of the common diaphoretics. Our object is to arrest the process of inflammation, and to prevent it from passing into suppuration. Where this is impossible, and the symptoms show that the process of suppuration has commenced, the cold lotion should give way to a warm emollient poultice.

Should our hopes of checking the disease be still disappointed, and the secretion of puriform mucus go on augmenting, the sac must be opened with the knife as soon as it is so overfilled, and the parts which cover it so far disorganised, that the middle of the tumour becomes soft and yellowish, pointing like an abscess. We make our incision in the direction of the longer diameter of the tumour, and as we withdraw the lancet, enlarge the opening downwards through the integuments, that the matter may have a free exit. We may now introduce a common silver probe into the sac, and direct it downwards into the nasal duct. We shall almost always find that it descends freely into the nostril. With tepid water and the lacrymal syringe, we next wash out the parts, and this is to be repeated daily. A common poultice is now to be applied, enclosed in a thin linen bag, and after the opening has continued for several days, and the matter has been freely evacuated, if the sac should continue hard, a warm poultice of cicuta leaves with camphor is recommended for discussing the induration. A mercurial plaister is also found useful for this purpose.

As soon as the object of these applications is gained, the wound is to be dressed with simple cerate. Under this treatment, the process of suppuration diminishes, and the matter discharged begins to lose more and more the character of pus, and to approach to that of mucus.

Should the unnatural secretion threaten to become habitual, a weak solution of sulphate of zinc (gr. ii. to ℥i. of water), made lukewarm, is to be dropped, once or twice a-day, into the nasal angle of the eye, and injected through the wound into the sac.

At this period, if the treatment has been properly conducted, we most frequently find that the canaliculi and the nasal duct have of themselves become permeable, the secretion of mucus natural in quantity and quality, and mixed duly with the fluids absorbed from the lacus lacrymarum. We therefore cover the opening into the sac with a bit of adhesive plaister, or apply such dressings to it as may induce it to close. If we have any doubt of the complete permeability of the lacrymal canals and nasal duct, we have recourse to that examination of the parts which I shall describe in the ninth and tenth sections of this Chapter.

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[1] Hunter on the Blood, Inflammation, and Gun-shot Wounds; Vol. ii. pp. 298, 331; 8vo; London, 1802.

[2] Praktische Beobachtungen über Augenkrankheiten, p. 32; Wien, 1791.

SECTION III. — CHRONIC INFLAMMATION OF THE EXCRETING LACRYMAL ORGANS.

Syn. — So long as the sac remained entire, the ancients called this disease *anchylops*; after it burst, *ægilops.* Dacryocystitis chronica. Blenorrhœa sacci lacrymalis. Watery eye, *Ware.* Flusso palpebrale puriforme, *Scarpa.*

Fig. Demours, Pl. XX. *figs.* 1, 2, 3. Dalrymple, Pl. VI. *figs.* 1, 2, 3.

This disease, by far the most common to which the excreting lacrymal organs are subject, occurs more frequently in women than in men. Occasionally we see it even in infants, depending, as there is reason to believe it often does also in adults, on a congenital narrowness of the nasal duct. It presents five different stages.

1*st Stage — Watery Eye.* The symptom which, in general, first attracts the patient's attention, is weakness of the eye, from the tears gathering at the inner canthus. Whenever he begins to read, or look earnestly at any minute object, he finds a tear standing in the eye, and ready to drop over on the cheek. Within doors, and in warm dry weather, he is less troubled with this stillicidium; it is much increased when he exposes himself to a cold moist atmosphere. To relieve himself of the inconvenience, he either simply applies his handkerchief to absorb the superabundant moisture, or puts his finger upon the sac, and forces its contents down into the nostril. He goes on, in this way, for perhaps months or years; but, by and by, he finds that the contents of the sac can no longer be made to descend into the nostril, but, on pressure, regurgitate through the puncta. This, however, still affords relief, and the patient probably persists in the practice for a great length of time.

This stage of the disease is, in general, attended with no pain; but on comparing the diseased side with the healthy one, we may always observe an additional degree of fulness at the inner canthus. The canaliculi, caruncle, and integuments are thickened, and somewhat inflamed, and the orbicularis palpebrarum and tensor tarsi are incapable of acting so completely as in health.

2*nd Stage — Blenorrhœa.* As the second stage approaches, the patient feels pain around the sac, attended with an additional degree of redness and swelling, at the inner canthus. On pressing the sac in his usual way, for the purpose of emptying it, he now observes that it is not pure tears, or a transparent mucus which is discharged, but an opaque fluid. If he becomes alarmed at this, and seeks advice, we find that whenever we press pretty strongly on the sac, a quantity of puriform mucus wells out through the puncta, and overflows the eye. Rarely, however, can our pressure empty the sac of its contents through the nasal duct, its permeability being for the most part suspended by general tumefaction of the mucous membrane, or by stricture at some particular point. Hence the patient almost always complains of dryness of the nostril, in this stage of the disease.

The extent of the blenorrhœal inflammation is various. The lining membrane of the sac is its chief seat. In many cases, we have reason to suspect that the whole excretory passages are affected; while in others, it is evident that one or other of the lacrymal canals only is the source of the discharge. I had under my care a lady in whom the upper lacrymal canal only seemed affected. The surgeon in the country, under whose care she had been, treated the case as one of inflammation of the conjunctiva; there was no lacrymal tumour; the matter, oozing from the upper punctum, inflamed the conjunctiva; and it was not till after repeated examinations, that I detected how limited was the seat of the disease.

The accumulated mucus, also, varies much both in quantity and quality. For instance, it accumulates more rapidly and is much thicker after taking food than at other times. The secretion of it is very plentiful, but thinner than usual, when the patient continues long in a moist and cold atmosphere. In this case, the overfilling of the sac sometimes takes place so rapidly, that the compression of the orbicularis palpebrarum in the act of winking, is sufficient to evacuate it through the canals to such a degree, that the surface of the eyeball is overflowed, and the puriform fluid runs down upon the cheek. After the patient remains for a short time in a warm and dry atmosphere, the morbid secretion becomes sparing and ropy. We find that this blenorrhœa almost disappears in many individuals during warm weather, upon which the yet inexperienced patient is apt to express a premature joy, for on the very first change to cold and wet weather, the disease most frequently returns as before.

3rd Stage—Abscess. It is evident, from what has been said, that the inflammation with which chronic dacryocystitis commences, is seldom considerable. In scrofulous patients especially, the purely inflammatory stage is not unfrequently overlooked, and no advice asked till puro-mucus has considerably distended the sac. The external signs of inflammation in different cases of the disease, and even in the same case at different times are very various. Sometimes we find the integuments free from discoloration, and merely elevated by the distended sac. At other times, they are severely inflamed, exquisitely tender to the touch, thinned by the pressure of the puriform mucus, and ready to give way. In fact, the longer the disease has lasted, the more liable does the sac become to attacks of inflammation, which, though repeatedly dissipated, generally end at last in the sac pointing like an abscess, bursting, and discharging the puriform fluid which it contains. After this, the opening in the skin may heal up, the disease return to the blenorrhœal stage, or even to that of mere watery eye; and for years the patient may in this way suffer from repeated abscesses of the sac, without submitting to any efficient treatment. The stage of abscess is attended with hemicrania and fever.

4th Stage—Fistula. If, in the stage of abscess, the collection of puriform mucus be left to itself, it will form a passage through the fibrous membrane by which the sac is covered, the orbicularis palpebrarum, and the integuments. The opening thus formed may not close, but merely contract after the contents of the sac are evacuated, manifest no disposition to heal, and degenerate into a fistula of the sac. Through such an opening, a great portion of the mucus and tears taken up by the puncta are discharged, very little, or none, going down through the nasal duct. This is a sort of natural cure of the disease.

It rarely happens that the opening through the anterior part of the sac is directly opposite to that which has been wrought, by the process of suppuration, through the fibrous layer of the lower eyelid, the orbicularis palpebrarum, and the integuments; and it is sometimes the case, that though there be but one opening into the sac, the matter forms beneath the skin several sinuses, which open by small orifices at different places, more or less remote from one another. This complicated kind of fistula is most apt to occur in patients of bad constitution, and is generally the result of often renewed attacks of inflammation during the course of this tedious disease. I have seen the irritation of a fistula of the sac communicate itself to the preauricular lymphatic gland, causing it to swell.

5th Stage — Caries. In those patients who have suffered from frequent abscess of the sac, and in whom the external opening has degenerated into a fistula, we sometimes find on introducing a probe, for the purpose of ascertaining the state of the nasal duct, that it comes immediately into contact with bare rough bone, or even that in consequence of the disorganized state, not merely of the soft parts, but of the bones by which these are surrounded, instead of passing with difficulty in the course of the nasal duct, it can be turned in various directions with little or no opposition. The os unguis and inferior turbinated bone are particularly subject to this carious state, but it sometimes extends also to the ethmoid and superior maxillary.

There is reason to think that, in such cases of carious fistula, not merely has inflammation spread from the lacrymal sac to the periosteum to which it is attached, but that the matter collected within the sac has drained through its posterior wall as well as perforated its anterior, and in this way induced the disorganization of the bones.

Carious fistula seldom, if ever, occurs, except in long-neglected cases, or when the individual is affected with scrofula, syphilis, or some other constitutional disease.

Causes. The general cause of the train of symptoms above detailed, is undoubtedly inflammation of the mucous membrane of the excreting lacrymal passages. This, at least in many instances, and at an early period, induces stricture of the nasal duct; an effect which in its turn operates powerfully in continuing the disease.

Congenital smallness of some part of the nasal duct is probably an occasional cause of chronic dacryocystitis. I operated on two twin sisters, the one at the age of 44, and the other at 45, in whom the disease was in all likelihood owing to a congenital tendency to stricture.

Chronic dacryocystitis is not unfrequently complicated either locally or constitutionally.

Locally, it may be connected with catarrhal inflammation of the Schneiderian membrane, or continued disorder of the Meibomian glands and conjunctiva; although certainly the doctrine of Scarpa, that the general cause of this disease is the absorption of puro-mucous fluid from the lids by the puncta, is incorrect.

It will, in many cases, be found, that chronic dacryocystitis is modified by some faulty state of the general health, and often by scrofula. There are other portions of the mucous system, the inflammation of which is strikingly modified by this latter cause. Mr. Hunter "suspected that there was something scrofulous in some gleets;"[1] and with gleet, or chronic, periodic, puro-mucous inflammation of the urethra, this affection of the lacrymal passages presents a striking analogy. Indeed it may be asserted in general, that the effect of scrofula upon any inflammatory disease, is to prolong its second stage, and to render it chronic. In other cases, chronic inflammation of the excreting lacrymal organs appears to depend upon the weakly constitution of the patient, although he be free from scrofula; and in others, it is evidently kept up, and in some it appears to be produced, by the disordered state of the digestive organs. Small-pox, measles, and scarlet fever, frequently call into action an occult scrofulous disposition, and at the same time give rise to the particular local disease which forms the subject of this Section.

As occasional causes of the relapses which take place in the course of this disease, we may mention the influence of cold while the individual is perspiring, long-continued weeping, and much stooping.

Prognosis. It is, in general, easy to afford great relief in chronic dacryocystitis, or even to remove the symptoms almost completely, so long as the remedial means are in use; but to cure it thoroughly and permanently, so that we can say that the lacrymal passage is again as good as ever, is what is very rarely accomplished, so rarely indeed, that many practitioners make no pretensions to do so, but at once announce to the patient the necessity of employing, for life, some mechannical contrivance, by the aid of which, the tears shall reach the nostril.

In children, the disease often subsides, and that rapidly and unexpectedly, towards the period of puberty, the osseous passage becoming then completely developed. Witness the case of Marguerite Périer, the niece of the celebrated Pascal, whose cure was so sudden, that it was deemed miraculous, and ascribed to the adoration of a relic![2]

The oftener the disease, already become in some measure habitual, has been attended with new attacks of acute inflammation, the less, in general, is our hope of completely curing it. If, in consequence of these relapses, a fistula of the sac should form, there sometimes follows almost a total closure of the nasal duct, while the mucous surface of the sac itself becomes so hypertrophied, that it is almost impossible to restore it to a healthy condition.

If the sac during this disease be not carefully and frequently emptied by pressure, its spontaneous evacuation will take place more and more seldom, the sac will become over-distended, the swelling even after the most complete evacuation will merely subside and not disappear, and an obvious laxity remain in the anterior part of the sac, and in the parts by which it is covered. This is a particular state, of which I shall treat, in a subsequent Section, under the name of *relaxation of the sac.*

In a case of long-continued blenorrhœa, with stillicidium, I observed the pupil of the eye of the affected side become expanded and fixed, and vision dim, while on the other side no amaurotic tendency was manifest. By adopting proper measures for the relief of the blenorrhœa, the amaurosis was removed.

Local treatment. The local treatment necessarily varies according to the particular symptoms which are present, their severity, and their duration. The object in view is, by removing the inflammation, puriform discharge, and swollen state of the lining membrane of the passages, to restore the tears to their natural course. In every stage of the disease, we require to bear in mind the inflamed state of the mucous membrane, and the probability of stricture existing in the nasal duct. The principal points, therefore, of the local treatment, fall under the head either of antiphlogistic remedies, or of such mechanical means as are likely to restore the nasal duct to its natural diameter.

1. *Leeches.* Even in the stage of *watery eye,* when the external signs of inflammation are not such as attract much attention, great advantage may be derived from the repeated application of leeches over the sac, or to the mucous membrane of the nostril. In the blenorrhœal stage, and especially during a renewed attack of inflammation, the pain, redness, and swelling of the integuments will still more evidently demand the employment of this remedy. Some surgeons attempt, in this disease, to pass up a bent probe, or lacrymal sound, from the nostril, through the nasal duct, into the sac; an operation always difficult, and often impossible to perform; but the bleeding, produced by the attempt, seems sometimes useful. I have even known it followed by a complete disappearance of the symptoms.

2. *Lotions — Fomentations.* Refrigerant lotions and emollient fomentations, applied by means of a piece of sponge or folded linen, over the sac, are useful in abating the inflamed state of the parts. Bathing the part with brandy and water, or even with pure brandy, is often useful. Fomentations with chamomile tea, or poppy-head decoction, give relief. Astringent lotions are also employed, especially in the blenorrhœal stage, in the hope that they may be taken up by the puncta, and conveyed through the canaliculi, into contact with the lining membrane of the sac and duct, an object more certainly effected by means of Anel's syringe. A solution of one grain of muriate of mercury, with six grains of muriate of ammonia, in eight ounces of water, may be used for this purpose; or a solution of from one to four grains of nitrate of silver, in one ounce of distilled water. The sac is to be emptied by pressure; then, a little of one or other of these solutions is to be poured into the nasal angle of the eye, the patient lying on his back, until the fluid is supposed to have reached its intended destination. If the passage be patent, the solutions will be tasted in the throat, in the course of a few minutes.

3. *Salves.* When the disease is complicated with disordered Meibomian follicles and conjunctiva, the red precipitate of mercury salve is often of advantage; not merely correcting the affection of the lids, but acting favourably upon the state of the lacrymal passages. About the bulk of a hemp-seed melted on the end of the finger, is introduced on the inside of the lids, and rubbed along their edges and into the neighbourhood of the puncta lacrymalia, once or twice a-day. When there is much hardening at the inner angle of the eye, friction with

diluted mercurial ointment, or with a salve containing calomel, or iodide of potassium, is useful.

4. *Forced expiration and inspiration.* The patient ought to be directed to blow his nose frequently, and immediately afterwards to endeavour to empty the sac, down into the nostril, by pressure with his finger. He ought to be warned against emptying it through the puncta, as by doing so he must indirectly aid the tendency to stricture of the nasal duct. He ought to sniff frequently; and occasionally closing the mouth and nostrils, inspire strongly, thus exhausting the air from the nostril, and nasal duct opening into it, and consequently removing their contents. These simple auxiliary means of keeping the passage free are not to be despised. If the lacrymal passages be perfectly free, and the secretion of tears abundant, as it is in raw weather, inspiring and expiring suddenly and strongly, undoubtedly empties the sac and duct. Dr. Jacob tells[3] us of an infant, cured of watery eye, by the nurse sucking the nose. Sternutatories may do good by exciting forcible expiration.

5. *Counter-irritation.* As a remedy of considerable use in chronic dacryocystitis, I may mention blisters and issues behind the ears and on the nape of the neck. The employment of sternutatories may also be serviceable by means of their derivative effect on the mucous membrane, as well as by exciting forcible expiration.

6. *Electricity* has sometimes proved useful. The method of employing it is, to insulate the patient, and, with a wooden point, draw the electric fluid from the neighbourhood of the lacrymal sac, either in a stream, or in sparks. This is to be continued for three or four minutes every day. When an obstruction of the nasal duct is suspected, shocks may be passed down the duct, by placing one director upon the sac, and another up the nostril.[4] Galvanism or electro-magnetism may be employed in the same way.

7. *Anel's probes.* In the first and second stages, benefit may often be derived from the passage of small probes, such as were first recommended by Anel, through the puncta and canaliculi, and down the sac and duct, into the nostril. A set of gold or silver probes, six in number, varying from $\frac{1}{55}$ to $\frac{1}{30}$ inch in thickness, is to be provided for this purpose. They must be perfectly round and smooth at their extremity, but need not be bulbous, and are not to be conical. The eyelid is to be put on the stretch, by pressing it somewhat towards the temple, with the fingers of the hand which does not hold the probe, and its edge drawn a little forward, so as to bring the punctum into view. If we intend to pass the probe by the superior canal, we first of all introduce it perpendicularly into the punctum from below upwards until it reaches the angle of the canal, and then turn it in a circle, until its point comes to be directed obliquely downwards and inwards, while at the same time we draw the lid somewhat upwards as well as outwards. If we are about to pass the probe by the inferior canal, we introduce it perpendicularly into the punctum from above downwards, and then lower the handle of the instrument to a horizontal direction. If the canals are patent, by continuing to press the probe onwards in the directions described, it enters the sac, so that we come to touch the nasal side of that cavity with the point of the instrument. Drawing back the point

a little, to prevent it being entangled in the lining membrane of the sac, we now turn it in the direction of the nasal duct, *viz.*, downwards and a little backwards, and press it slowly onwards till it strikes the floor of the nostril, or till we meet with such opposition as may lead us to conclude that the duct is closed, or much contracted. In doing all this, the danger of penetrating the walls of the duct must be borne in mind.

The introduction of the probe is to be repeated from day to day, and though it is plainly impossible, even by a succession of probes of different sizes, to restore the nasal duct to its natural diameter, yet, by this means, in combination with others, and particularly injections, the obstructed state of the duct may often be so far overcome, that the tears and mucus shall again pass into the nostril.

8. *Injections.* I have occasionally succeeded in completely curing slight incipient cases by injections with Anel's syringe, but much more frequently I have failed. The sac is first to be emptied, and, if possible, downwards into the nostril. The syringe, with its piston accurately fitted to the cylinder, and stuffed if necessary with lint, its point being screwed off, is to be filled with tepid water. Its point, being now screwed on, is to be passed through one or other punctum, into the sac, in the manner already described for the introduction of the probe. The piston is now to be very slowly pressed down; the sac becomes filled; and, if the duct is free, the water flows from the nostril, or into the back of the throat. If the duct is not free, the sac is left distended. We now endeavour to press the fluid, with which it is filled, down into the nostril, placing the finger for this purpose between the puncta and the sac, and pressing from the puncta towards the nose. Whether the water has reached the nostril, or has been prevented from doing so by the obstructed state of the nasal duct, we now take up with the syringe the medicated injection, and use it in the same manner.

It is by no means indifferent what is selected for a medicated injection. In a case of blenorrhœa of the lacrymal passages, with much inflammation of the conjunctiva, I first of all tried water, without getting any of it to flow into the nostril. In the course of four or five days' trials, I employed, first a solution of lapis divinus, of which a drop or two reached the fauces; then greatly diluted muriatic acid, of which a good deal flowed into the nostril; then greatly diluted nitric acid, which flowed very freely. The inflammation of the conjunctiva and the blenorrhœa of the sac, greatly abated under this plan, in which, no doubt, each injection prepared the way for the favourable effect of the next. On the whole, I have found diluted aqua potassæ the best injection. For this purpose, from ʒss. to ʒi. may be mixed with ℥vi. of water. It always causes a large discharge of mucus from the interior of the sac, and often in a few days removes the blenorrhœa, even when profuse. It seems to possess a much greater power of correcting the inflamed state of the mucous membrane of the lacrymal passages, and changing the secretion of its follicles, than the solutions of sulphate of zinc, or nitrate of silver.

Whatever medicated injection is chosen, it ought to be repeated once every day, or every second day. Injections may either be tried alone, or, according to Anel's plan, in combination with the use of the probe.

Sir William Blizard proposed[5] to treat this disease in its early stages, by filling the sac with quicksilver; but this must be regarded more as a test of the state of the duct, than a remedy for dacryocystitis.

9. *Probes and injections introduced from the nostril.* The method of Laforest[6] consisted in introducing probes into the nasal duct from the nostril, and in throwing injections up into the sac through tubes passed in the same way. In some subjects, it might be easy to do this; but the difficulties generally found to attend the introduction of a probe or a tube from the lower meatus of the nostril into the nasal duct, caused the practice to be abandoned for many years. It has again been revived in France, however, by Gensoul, Verpillat, and others[7], and in England by Morgan.[8]

10. *Poultices.* The remedial measures hitherto spoken of, presume the lacrymal passages to be entire. If the patient suffers from a renewed attack of inflammation, and we fail in reducing it by the means already pointed out, we must proceed as in acute dacryocystitis, apply an emollient poultice, and wait till suppuration advances.

11. *Incision of the sac — Daily passage of a probe.* As soon as the fluctuation of the abscess is distinct, we lay the sac open as has been directed in the last section. Even in cases where the swelling is small, we shall be surprised at the large quantity of matter which is discharged. On proceeding to examine the nasal duct with a common probe, we almost uniformly find it contracted at one or several points of its extent, so that it often requires very considerable force to press the probe through the duct, till it touches the floor of the nostril. To remedy this state of contraction, as well as to relieve the other symptoms, the daily passage of the probe sometimes answers well. The opening into the sac continues patent, in general, for three or four weeks, if the probe is passed regularly every day. By pressure, the probe aids in promoting the absorption of the substance infiltrated into the sub-mucous tissue, and which causes stricture of the duct. A thicker and a thicker probe may be used, as the cure proceeds. The probe interferes in no degree with the employment of other means, such as injections, inunction with mercurial salve, and the like. I consider the probe much to be preferred to the style, in children.

12. *Introduction of a style.* The introduction of a style is a very useful method of treating chronic dacryocystitis, not merely after a renewal of inflammation, terminating in abscess of the sac, but in every stage of the complaint, except the first. The style is a nail-headed piece of silver wire, about 1¼ inch long, and $\frac{1}{20}$ inch thick. The head should be plano-convex, with its edge rounded off, lest by pressure it cut the skin, and the neck should form an angle of about 130° with the body, as is represented in *fig.* 34. The surgeon requires to have a series of styles by him, of different lengths and degrees of thickness. The inclination of the neck requires also to be changed according to the form of the orbit, and the distance of the lacrymal sac from the surface, circumstances which vary remarkably in different subjects. The style is an instrument

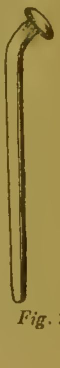

Fig. 34.

which generally may be worn for an unlimited time, not only without annoyance to the patient, but with a great degree of comfort.

The probe, which was passed immediately after opening the sac, being withdrawn, and a little tepid water injected, the style, previously put through a bit of adhesive plaister, is introduced from the sac into the duct, and pushed down so that the bit of plaister comes into contact with the integuments. The plaister serves to bring the edges of the incision as much together as the presence of the style will permit, and prevents the style from sinking through the wound into the sac. As an additional means of preventing this accident, a bit of thread may be tied round the neck of the style, and fixed to the forehead with a drop of collodion. The wound closes gradually round the style, which is not to be entirely taken out for the first four or five days, but, to allow the parts to be cleaned, is merely to be raised a little daily, as is represented in *Fig.* 35., and immediately pushed down again. After the wound has healed so much that the opening closely embraces the style, this is to be taken out every morning, the nasal duct injected with tepid water, or some weak astringent solution, and the style replaced. The aperture through the integuments into the sac soon becomes fistulous, having no disposition to close.

During the time that the style is worn, the previous symptoms disappear almost completely. The style dilates the duct, in the same way as a bougie dilates the urethra. The tears and mucus, absorbed by the lacrymal canals, appear to be attracted between the surface of the style and the lining membrane of the nasal duct, and thus the function of the parts being restored, the inflammation, watery eye, and blenorrhœal discharge quickly subside.

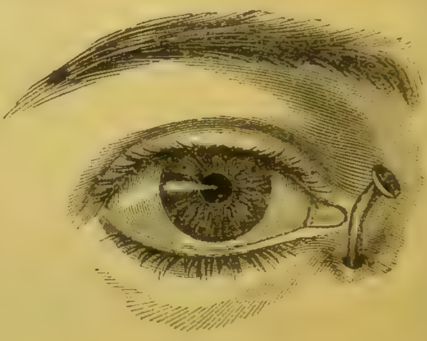

Fig. 35.

Although a style be worn, and the nasal duct be perfectly free, tears sometimes continue to distil from the puncta, or by the head of the style. This may arise from an inactive state of the puncta and canaliculi; or it may be owing to the style being too slender, so that capillary attraction is not sufficiently accomplished between its surface and that of the mucous membrane.

It frequently happens that a patient, after wearing a style for three or four months, has it withdrawn, thinking the disease cured. After a time, however, the blenorrhœa returns, the style is re-introduced, and the symptoms again subside. After three or four months more, it again becomes a question, whether the style should be removed. The patient often objects to its removal. He knows the inconvenience of the disease, and the little trouble of the remedy, and prefers continuing the use of the style, rather than run the risk of the blenorrhœa returning. I have known even ladies object to giving up the style, having once experienced a relapse from its removal.

To prevent it from becoming oxidized, the silver style is sometimes gilt; but, I presume from some galvanic effect, such a style gives rise to a disagreeable feeling, from which the use of a common silver one, or one entirely of gold, is exempt. The head of the style may have its head enamelled of a skin colour, so that it shall scarcely be observed, or blackened with sealing-wax, so as to look like a little patch. Styles are made of gutta percha, and various other materials. An extemporaneous one may be made of a bit of leaden wire. On no account must the style be left without regular removal and replacement. A patient in the lower ranks of life called upon me, with a silver style, which had been introduced by the late Dr. Monteath, and which had not been taken out for more than six months. It was all but corroded through, about a quarter of an inch below the head, the silver being converted into a sulphuret, by the sulphur present in the secretions from the mucous membrane.

In one instance, I witnessed profuse bleeding from the nostril during the day and night after pushing down a style. A short one had been worn, but not reaching the nostril, a longer one was introduced, and was followed by this effect.

It is important to remark, that the style itself is occasionally a cause of irritation. It often is so, for some days after it is first introduced. We are obliged to apply an emollient poultice over the sac, or even to withdraw the style. Months after it has been introduced, and proved highly serviceable, we sometimes find that the patient complains of matter being still discharged by the side of the style. In such cases, we should consider how far the style itself is a cause of this discharge; and if the Meibomian follicles, conjunctiva, and lacrymal passages, appear in every other respect sound, except only in the puro-mucous discharge by the side of the style, let it be gradually shortened, and at length removed, and a trial made whether every thing will not, now that the passage is patent, go on as it ought to do.

By shortening the style bit by bit, we try the state of the lower portion of the duct. If matters go on well with a short style, we may conclude that the passage is healthy, and think of removing it entirely; but if the disease returns under the use of the short style, we must re-introduce one of the original length. When we withdraw the style, with the intention of no longer replacing it, the edge f the opening through the integuments should be made raw; for if his is not done, it is apt to contract to an almost capillary fistula, very difficult to close. This I shall notice more fully in the next section. Sometimes, indeed, this minute callous opening may, in self furnish a palliative cure[9] for chronic dacryocystitis. A lady onsulted me, who had long been under the care of Dr. Monteath, or blenorrhœa and relaxation of the sac. She had worn a style for length of time, but without a cure being effected. Dr. Monteath roposed laying open the sac and stuffing it, as is recommended in ertain cases by Scarpa, but the patient declined this. The style was emoved, the opening did not close, but continued patent for years; mucus continued to collect in the sac, and kept it greatly dilated; he eye was strong, and the patient thought nothing of the inconenience of being obliged several times a-day, to press out the mucus hrough the callous orifice.

The long-continued wearing of a silver style is apt to dye the skin permanently, round the opening into the sac, of a blackish hue. Among the bad effects of the style, I must mention also that, especially in children and young people, if used during a lengthened period, it is apt to be followed by atrophy of the sac, with a sunken state of the integuments, which continues after the style is removed and the aperture into the sac closed. In some rarer cases, we see ectropium of the inner half of the lower eyelid produced by the style.

13. *Escharotics.* When the sac is laid open, for the purpose either of merely evacuating the matter pent up within it, or of following out the cure by the daily passage of the probe or the introduction of a style, we have an opportunity of applying escharotics to the internal surface of the sac; a practice at one time carried to excess, but which may sometimes be necessary. When the lining membrane of the sac is greatly thickened, stuffing it with lint, dipped, as Scarpa recommends[10], in a liniment consisting of red precipitate and mucilage of gum-arabic, or touching the inside of the sac with lunar caustic, may be proper.

Lallemand tells us[11], that a method long used in Italy, is to puncture the sac, and introduce into it a small bit of lunar caustic; then a little stripe of amadou is pressed into contact with the caustic, to prevent it, when melted, from flowing out by the opening. Acute inflammation follows; but diminishes next day, and ceases in two or three days. The swollen parts fall, and resume their natural colour, and the wound closes. One such application, it is stated, usually suffices to cure the disease; but sometimes two or three applications are necessary. This plan operates by removing the chronic inflammation of the mucous membrane of the sac and duct, in the same way as lunar caustic cures inflammation of the conjunctiva.

14. *Introduction of a tube.* This old practice, which was revived and extensively employed by Dupuytren, has often been brought forward anew, and again allowed to fall into neglect. The objections urged by Mr. Ware[12] and others, against the introduction of a gold or silver tube down the nasal duct, there to be left for life or for an indefinite period of time, have chiefly been, either that it sank down through the duct into the nostril, or, exciting inflammation, was pushed upwards, by the swelling of the mucous membrane, so as to project under the skin covering the sac, and required to be removed. These objections may, no doubt, in a great measure be obviated, by employing a tube of an appropriate form and size. Instances are recorded, in which, with attention to those points, such an instrument has remained in the nasal duct for many years[13], and appeared to afford a complete cure.

It may fairly be doubted, whether the tears actually flow through the metallic canal, furnished to them by this contrivance, or descend merely on the outside of the tube, as they do along the surface of a style. The tube probably operates more in dilating the duct, than in affording a channel for the tears; and I am disposed to think, that a gold style, furnished with a round head of such thickness as to allow it to sit easily in the lacrymal sac, but to prevent it from sinking down the duct, and over which the sac and the skin should be healed, and which should be worn for life, might answer the purpose just as well as a tube, or better.

If a tube is to be used, the sac is to be freely laid open, from the tendon of the orbicularis downwards and outwards, and the state of the duct examined with a probe. If sufficiently wide for the reception of the tube, this is to be introduced immediately; if contracted, it must be dilated, by a series of styles, or pieces of catgut of increasing thickness. The tube (*Fig.* 36.) ought to be from $\frac{3}{4}$ inch to 1 inch long, and taper gently from its upper to its lower extremity; the former is furnished with a projecting rim, measuring $\frac{1}{6}$ inch in diameter, whilst the latter measures $\frac{1}{12}$ inch. Fashioned in one piece, without any soldering, of gold or platinum rather than silver, the tube is to be slightly curved in correspondence with the curvature of the nasal duct, that is to say, with its convexity forwards and its concavity backwards, and its lower extremity is to be truncated obliquely, so that its oval orifice shall look downwards and backwards. The instrument for introducing the tube into the duct is a stylet (*Fig.* 37.), with a handle oining it at an obtuse angle. The stylet fits into the tube so loosely hat it may be easily withdrawn after the tube is fixed in its situation. Mounted on this instrument, then, the tube is to be introduced into he sac, and thence down into the duct; such a degree of pressure eing exercised upon it, as to push the projecting rim to the bottom f the sac. The stylet is now withdrawn, and the lips of the wound eing accurately adjusted, they are to be kept together by a drop f collodion, or a bit of court plaister.

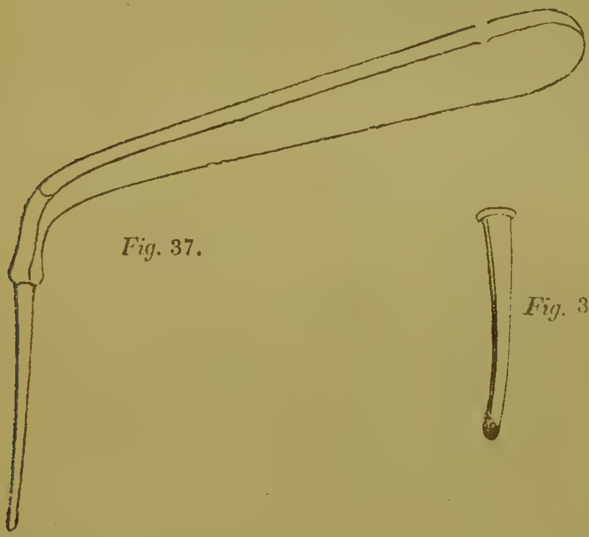

Fig. 37.

Fig. 36.

It occasionally happens that the presence of the tube produces so uch irritation that it is necessary to withdraw it. This it is someimes difficult to effect. In order to be provided against such a posibility, it is recommended that in the original construction of the ube, a groove should be sunk along the inside of its head, so that it ay be laid hold of by means of a bifurcated stylet, the blades of hich have a catch at their extremity, and by their elasticity separate from each other, unless kept together by a sliding ring. The sac being laid open by an incision, this instrument, with its blades closed (*Fig.* 38.) by the sliding ring, is to be pushed down the tube, the edge of which forces up the sliding ring, and the blades (*Fig.* 39.) diverge. By now drawing up the stylet, the catches at the end of its blades hook against the edge of the groove, and by this means the surgeon gets such a hold of the nube, that it can be withdrawn it a perpendicular direction. For the same purpose, Mr. Liston recommended a probe, formed into a screw. Introduced into the tube, the screw is fixed in it firmly by a few turns, and thus the tube is extracted.[14] It is almost impossible to lay hold of the tube with a pair of forceps.

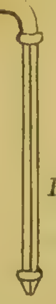

Fig. 38.

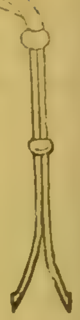

Fig. 39.

In the following case, a lacrymal tube having effected a perfect cure of chronic dacryocystitis, took its leave in a manner as inconvenient as unexpected: —

Case 178. — A woman called on me, 4th July 1840, to complain of something growing, as she said, from the roof of her mouth. On examination, I found a metallic substance projecting through the left side of the palate. On inquiring into her history, I found that my colleague, Dr. Nimmo, had operated on her for fistula lacrymalis, at the Glasgow Eye Infirmary, six years before; but without informing her that any instrument was left in the passage. Seizing the piece of metal with pincers, I extracted it apparently from the antrum. It descended in a vertical direction, as I drew it out. It proved a silver lacrymal tube of the usual size, not much corroded, but its calibre filled apparently with food, its lower orifice, by projecting for some time into the mouth, having allowed this. The opening in the palate speedily closed, and the patient continued free from any lacrymal complaint.

General treatment. However well chosen and carefully conducted our local treatment of this tedious and troublesome disease, we shall probably find it to have comparatively little effect, unless we at the same time employ every means we possess of improving the patient's general health.

Chronic dacryocystitis, in scrofulous children, who sometimes present the disease on both sides of the face, is often attended with extensive destruction of the integuments round the fistulous opening communicating with the sac, and is not unfrequently connected with caries of the bones forming the osseous canal for the transmission of the nasal duct. In such subjects the style is difficult to manage, is not productive of the same amount of benefit as in adults, and not unfrequently must be laid aside, on account of the irritation it occasions. On the other hand, constitutional remedies are of much greater utility in cases of scrofulous inflammation of the sac in children, than in the chronic dacryocystitis of adults. I have seen a complete cure effected by the use of the iodide of potassium, without any manual interference with the parts.[15]

In scrofulo-syphilitic cases, I have found the administration of equal parts of cinchona and sarsaparilla, in powder, very useful.

In weakly persons, whether scrofulous or not, the employment of the preparations of iron and cinchona will be found highly beneficial.

When the prolongation of the disease depends on derangement of the digestive organs, it will be necessary to begin by restoring these to a healthy state. This will be best effected by small doses of blue pill at bedtime, followed by a laxative in the morning, as has been recommended by Mr. Abernethy.[16] I have known a smart dose of calomel and jalap remove all the symptoms, even when the sac was filled with matter. In almost every case, advantage will be reaped from cold bathing, country air, and regular exercise. Change of climate has been known of itself to effect a cure.[17]

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[1] Treatise on the Venereal Disease, p. 159; London, 1810.

[2] Bossut, Discours sur la Vie et les Ouvrages de Pascal.

[3] Dublin Hospital Reports, Vol. v. p. 377; Dublin, 1830.

[4] Cavallo on Electricity; Vol. ii. pp. 149, 167, 186; London, 1795.

[5] Philosophical Transactions for 1780; Vol. lxx. part i. p. 239

[6] Mémoires de l'Académie Royale de Chirurgie; T. v. p. 79; 12mo; Paris, 1787.

[7] Journal Hebdomadaire des Progrès des Sciences Médicales; Tome i. p. 114; Paris, 1836.

[8] Lectures on Diseases of the Eye, p. 220; London, 1839.

[9] See Practical Observations on the Diseases of the Inner Corner of the Eye, by Joseph Reade; London, 1811.

[10] Trattato delle Malattie degli Occhi, Vol. i p. 39; Pavia, 1816.

[11] Des Pertes Séminales Involontaires, Tome iii. p. 418; Paris, 1842.

[12] Observations on the Treatment of the Epiphora, or Watery Eye, &c., p. 74; London, 1818.

[13] Ansiaux, Clinique Chirurgicale, p. 115; Liège, 1829.

[14] Lancet, July 13, 1844. p. 491.

[15] London Medical Gazette; vol. x. p. 130; London, 1832. See Manson's Medical Researches on the Effects of Iodine, p. 273; London, 1825.

[16] Surgical Observations on the Constitutional Origin and Treatment of Local Diseases.

[17] Haynes Walton's Operative Ophthalmic Surgery, p. 213; London, 1853.

SECTION IV. — FISTULA OF THE LACRYMAL SAC.

Fig. Ammon, Thl. II. Tab. VIII. *figs.* 11, 12, 13, 14, 15. Dalrymple, Pl. VI. *fig.* 4.

It must be apparent, from what has already been said, that fistula of the sac is usually the consequence of neglect in acute inflammation of the excreting lacrymal organs, or of reiterated attacks of inflammation during the course of chronic dacryocystitis. If the inflamed sac be not opened at the proper time, but the collection of puriform mucus be left to itself, it will form a passage through the fibrous layer by which the sac is covered, the orbicularis palpebrarum, and the integuments. The opening thus formed may close soon after, and every thing go on well. But in many cases, the opening merely contracts, manifests no disposition to heal, and degenerates into a fistula of the sac, through which a great portion of the mucus and tears taken up by the puncta are discharged, little or none going down through the nasal duct. Lacrymal fistula is occasionally complicated with a hypertrophied state of the lining membrane of the sac, and generally with stricture of the nasal duct.

Prognosis. The least disagreeable circumstance which takes place when inflammation of the sac has ended in fistula, is an external cicatrice more or less visible. In general, the cicatrice is pretty deep, and may even produce a degree of ectropium. If the fistula be allowed to continue for a length of time, contraction or even obliteration of the nasal duct, from disuse, is likely to be the consequence. The prognosis is favourable when, on pressing the sac, tears issue along with the morbid mucous secretion, although not mixed with it; for this proves that the absorption of the tears by the puncta, and their conveyance into the sac, by the canals, are restored. The restoration of the nasal duct only now remains doubtful.

Treatment. Whatever be the conditions under which a fistula of the sac presents itself, whether it be simple, and open directly into the sac, or complicated, so that several apertures perforate the skin at different distances from the sac, and communicate with it by sinuses placed at different depths under the integuments, the practice to be followed is one and the same; *viz.*, to lay open the sac in the usual manner, introduce a style down the nasal duct, secure the style from slipping into the sac, and apply an emollient poultice. This is the plan to be followed, even should it happen that the fistula is so deeply situated, that a portion of the superior maxillary bone, over which it runs, has been laid bare or become carious. When this is the case, the fistulous opening is surrounded by fungous granulations, an ichorous matter is discharged, the integuments around are of a deep red colour, and the denuded or carious bone is felt with the probe.

By means of the style, the tears are conveyed along their natural channel, and the fistulous track or tracks readily close, without any other application than the poultice, which is to be discontinued as soon as the hardness of the diseased parts has subsided. The style is not to be removed entirely, till the surgeon has made a careful examination of the lacrymal canals and nasal duct, and satisfied himself of their permeability and effectiveness.

There is a particular variety of fistula, which must be noticed, *viz.*, that which results from the wearing of a style. The purpose for which this instrument was employed being answered, by a dilatation of the nasal duct to its natural diameter, the style is removed, and the orifice through the skin contracts, but sometimes does not close. We try to close it by making its edges raw with the lancet, and touching it from time to time with lunar caustic. Some touch it with a red hot wire. These means occasionally succeed, but in other cases they fail, and tears continue to trickle from the minute opening, and inflame the cheek. In such a case, two small concave incisions may be made around the fistulous opening, the intervening piece of skin extirpated, and the lips brought together by a stitch. So troublesome have such cases proved, that recourse has sometimes been had to the transplantation of a flap of skin.[1]

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[1] Journal Complémentaire des Sciences Médicales; Tome xl. p. 388; Paris, 1831: Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 405; Dresden, 1831.

SECTION V.—CARIES OF THE BONES AROUND THE LACRYMAL SAC AND NASAL DUCT.

Fig. Ammon, Thl. II. Tab. VIII. *fig.* 17.

It cannot be denied that carious fistula occasionally arises in the manner described in the Third Section. Neither is there any doubt that the os unguis and neighbouring bones sometimes become affected with inflammation from scrofula or syphilis, and that the inflammation in these cases may terminate in caries.

In caries of the os unguis from constitutional causes, the swelling is more deeply seated, and the symptoms of disease in the excretory apparatus of the tears more slowly developed, than in primary affections of the lacrymal sac. For some time after the obscure tumefaction has continued, with very considerable pain, in the neighbourhood of the os unguis, the excreting lacrymal organs continue to execute their functions; whereas, when the mucous membrane is the part first affected, the conveyance of the tears into the nostril is much sooner impeded. At length, the lacrymal sac and nasal duct becoming inflamed, the symptoms bear a nearer resemblance to those described in the preceding Sections. The posterior part of the sac becomes ulcerated, and unless some successful plan of treatment be adopted against the constitutional disease, the caries of the bones and the ulceration of the soft parts continue, the integuments give way, a fetid ichor is discharged, and the excretory lacrymal passage may be destroyed.

General treatment. In such cases, if the local affection depends upon syphilis, the proper remedies against that disease are to be exhibited. A tonic plan of treatment must be followed, if the caries appears to be of scrofulous origin, and a course of iodine will be found advantageous.

Local treatment. No interference with the diseased bone can be of any use, either while the scrofulous or syphilitic action is going on, or afterwards. On the contrary, such interference would in all likelihood exasperate the disease. The introduction of a style, and the cautious injection of a solution of nitras argenti, make up the local treatment. The former serves to attract the tears along their natural course, while the latter corrects the blenorrhœal discharge, and represses the tendency to fungous granulations.

It sometimes happens that the style drops from the lacrymal passage into the antrum, or into the mouth through a carious aperture in the palate. This may happen not only in syphilitic, but in scrofulous cases, followed by ulceration spreading round the eye, and affecting the septum and alæ of the nose; the vomer comes away with pieces of the superior maxillary bone, and the nose falls in. In scrofulous cases of this sort, I have found sarsaparilla eminently serviceable.

SECTION VI. — RELAXATION OF THE LACRYMAL SAC.

Syn. — Hernia sacci lacrymalis, *Beer.*

Fig. Ammon, Thl. II. Tab. VIII. *fig.* 6.

The lacrymal sac is sometimes protruded from its natural situation, without much unnatural dilatation[1], a state of parts which has been called *hernia;* but, in general, this term has been applied to the affection of the sac I am now about to describe.

Symptoms. The sac presents a tumour, of the shape, and generally about the size, of a horse-bean; sometimes, however, much larger; the integuments covering it are scarcely or not at all discoloured, it is not painful, and it yields more or less easily to the pressure of the finger. These symptoms are sufficiently characteristic to distinguish *relaxation* from *mucocele.*

Upon pressure, the contents of the sac in the state of relaxation are generally discharged either by the canals and puncta, or by the nasal duct, according to the direction in which the pressure is applied. Sometimes, however, the sac can be evacuated only down the nasal duct. The fluid is usually transparent, or presents merely a streak of whitish matter; but occasionally, from the presence of blenorrhœa, it is entirely yellowish and opaque. Upon evacuation of the sac, the tumour is almost completely removed, but its integuments remain folded and wrinkled, and it very soon becomes filled again. If the fluid does not consist of mucus duly mixed with tears, but presents whitish streaks, or if it consists entirely of a catarrhal matter, we feel a little elasticity in the sac after the evacuation, and there remains some degree of swelling, owing to the tumefaction of the lining membrane of the sac.

The sac in the state of relaxation has lost its natural contractility of texture. Even that part of the orbicularis palpebrarum which covers the sac, and to which the duty of emptying it partly belongs when it becomes filled with fluid, having suffered from long-continued extension, is incapable of contracting with a sufficient degree of force, and is somewhat in the state of the muscles of the abdomen after the removal of the water of an ascites. The patient is consequently obliged to do with his finger, what ought to be done spontaneously by the parts themselves. He is obliged to evacuate the sac by pressure frequently in the course of the day, and it is fortunate if he begins and continues the practice of evacuating it by the natural route through the nasal duct, and not through the lacrymal canals.

The general cause of relaxation is over-distention of the sac by puriform mucus, during neglected dacryocystitis. Sometimes, as has been already stated, blenorrhœa still continues, or has recurred. Most frequently the blenorrhœa has disappeared, and left relaxation behind it, along with an excessive secretion of healthy mucus. In this case we are called upon to limit this secretion, and to restore to the anterior side of the sac, the orbicularis, and the integuments, their natural cohesion and elasticity, in order that the important function of evacuating the contents of the sac through the nasal duct may be resumed.

Prognosis. We ought to forewarn the patient that the cure will be tedious, and require much attention upon his part.

Treatment. This consists in the use of two distinct means, each of which, as may be seen by the testimony of Pellier and others, is, when used alone, apt to fail.[2]

The *first* is the compression of the sac; and here let it be observed, that the present is the only case in which compression of the sac is useful. In any other disease of that part, this practice would produce injurious effects. The compression must be carefully applied, constantly continued, and gradually increased. Machines have been invented for this purpose, but they never fulfil, with precision, all these conditions. We cannot by such an instrument as Sharp's or Petit's compressorium, the first invention of which we owe to Hieronymus Fabricius, keep up a regular and an increasing pressure; the compressing surface upon the least occasion, especially during the night, is disarranged; and the patient is hindered from pursuing his business by the presence of such an apparatus. Graduated compresses, then, are to be preferred. Garengeot recommends the surgeon to chew a piece of brown paper, and lay it on next the skin. It will compress the sac, he says, exactly, and as it dries, so mould itself to the figure of the part, that the compression shall always be the same.[3] Over the compresses a firm leather pad of a proper form is to be placed; and the whole is to be supported by a narrow roller passing round the head. In this manner, the pressure affects exactly the part which ought to be acted upon; it can be daily increased; the pad cannot, even when the patient is very restless, be shoved aside; nor need such an apparatus prevent him from following his ordinary employment, even out of doors.

The *second* part of the treatment consists in the application of some astringent fluid, both to the external surface of the tumour, and to the internal surface of the relaxed sac. A great variety of astringents might be mentioned as proper for this purpose; such as solution of alum, infusion of oak bark, &c. The graduated compresses are to be moistened twice or thrice daily with the astringent fluid which may be selected. A small quantity also of the same, or of some similar fluid, is to be dropped into the lacus lacrymarum, and left to be absorbed by the puncta.

I have known these means fail after the most careful trial. A medical gentleman, who came under my care with relaxation of the lacrymal sac, found pressure hurtful rather than useful. He derived considerable benefit from oak-bark decoction, dropped into the lacus lacrymarum, and used as a lotion. The disease arose without blenorrhœa, merely from the tears and mucus accumulating in the sac. Blenorrhœa afterwards supervened. If the patient went to bed with the sac distended, he found it empty in the morning. The use of a style afforded this patient the most relief. In another case, a fistulous opening, left after the removal of a style, afforded to the patient the means of emptying the sac, one or twice a-day, of a large quantity of healthy mucus. In such a case as this, the sac might with propriety be exposed by an incision of the integuments, and a portion of it removed with the scissors, an operation sometimes had recourse to in mucocele.

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[1] Archives Générales de Médecine; Tome xx. p. 578; Paris, 1829.

[2] Pott, Observations on the Fistula Lacrymalis; Works, Vol. i. p. 252; London, 1808: Pellier de Quengsy, Cours d'Operations sur la Chirurgie des Yeux; Tome ii. p. 270; Paris, 1790.

[3] Traité des Operations de Chirurgie, Tome iii. p. 78; Paris, 1731.

SECTION VII.—MUCOCELE OF THE LACRYMAL SAC.

Syn.—Hydrops sacci lacrymalis, *Beer.* Varix sacci lacrymalis, *Schmidt.*

Fig. Ammon, Thl. II. Tab. VIII. *fig.* 18.

Symptoms. This disease presents in its commencement the oblong shape of the sac, the tumour which it forms slowly increases, and I have seen it reach the size of a pigeon's egg without bursting. In some cases the tumour appears double, being partially divided by a depression in its middle. The integuments covering the tumour, ultimately assume a livid colour. A mucocele is often so hard that it scarcely yields to the pressure of the finger. In other cases, it is soft and elastic. But whether hard or soft to the touch, no degree of pressure is capable of evacuating, either through the puncta or into the nostril, the mucus which in this disease is pent up within the sac. A mucocele may reach a very considerable size, and continue of the same magnitude, and without pain, for many years; the eye watery, the nostril dry, and considerable deformity resulting from the bulk and appearance of the tumour. It is not until the over-filling of the sac has reached its highest possible degree, and the mucocele threatens to burst, that the disease is attended with a painful feeling of tension. The patient at this period cannot more than half open his eyelids, on account of the size of the tumour. The lower lid especially is put on the stretch, and projected towards the nose. The sac is also very considerably extended within the orbit.

On examining a mucocele, we distinguish an indistinct, and in many cases, no fluctuation. This depends upon the state of the contained mucus, which may be either quite fluid, or may have acquired a gluey consistence. In the former case, an indistinct fluctuation is felt, the tumour is still a little elastic, and does not exceed the size of a horse-bean. In the latter case, the colour of the integuments is livid, like that of a varicose vein, the mucocele feels hard like a pebble, and presents not the slightest degree of fluctuation, while the tumour is already so large as to rise over the caruncula lacrymalis.

The frequent livid colour of the integuments in mucocele, has led some authors to describe this disease under the name of *varix of the lacrymal sac;* while the hardness and size of the tumour, added to its colour, have sometimes led to the extirpation of the sac affected with mucocele, under the idea that it was a carcinomatous tumour.

Causes. Mucocele is the consequence of an obstructed state of the lacrymal canals and nasal duct. In some instances, the cause is a congenital contraction of the lower extremity of the nasal duct, occasionally combined with an unnatural course into the nostril. Under such circumstances, the secretion of mucus from the internal surface of the sac goes on; but as it can neither be diluted by the tears, discharged into the nose, nor completely re-absorbed by the membrane which secretes it, it accumulates, and forms the tumour in question.

Treatment. The lancet is to be pushed into the most prominent part of the tumour. The wound may sometimes require to be enlarged upwards and downwards in the direction of the length of the sac, both that its contents may be evacuated, and that we may be able to proceed in the remaining steps of the treatment; but in general a simple puncture with the lancet is sufficient. In performing this operation, as well as in other operations on the sac, we should always avoid dividing the tendon of the orbicularis papebrarum. Yet the inconvenience arising from cutting that tendon across, is less than might have been anticipated; for after the wound has healed, the eyelids retain their natural position, and the muscle performs its functions as before. This is to be attributed partly to the ligamentous layer which lies beneath the muscle and supports the eyelids, and partly, as Mr. Sharp remarked[1], to the firm cicatrice which is left when the cure is completed. In dividing the tendon, however, there is a danger of cutting across the canaliculi, which would probably produce incurable stillicidium.

If the mucus be liquid, or if the sac be filled, as is sometimes the case, with thick fetid pus, a little of it issues as soon as the incision is completed. The remainder is to be cleared out, by means of a small syringe introduced by the wound, through which a quantity of water is to be repeatedly injected. If the mucus has become inspissated, it is to be extracted by the repeated introduction of a small pair of forceps; after which, the sac is to be completely washed out.

A common dressing-probe may now be passed through the sac, in the direction of the nasal duct; or this exploration may be dispensed with for the present, and a small quantity of soft lint may be placed within the lips of the wound, and covered with a piece of court plaister. Next day, the lacrymal canals and nasal duct are to be examined, and the causes of the mucocele being ascertained, the proper treatment is to be commenced.

In cases of very large mucocele, it may be proper to lay bare the sac in the first instance, and excise a portion of it with the scissors.

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[1] Treatise of the Operations of Surgery, p. 181; London, 1758.

SECTION VIII.—RELAXATION OF THE PUNCTA LACRYMALIA AND CANALICULI.

We meet with cases in which the puncta and canaliculi are in a state of relaxation, attended with atony of the orbicularis, and probably of the tensor tarsi; the consequence of which is *stillicidium lacrymarum;* a symptom uniformly depending on some defect in the absorption and conveyance of the tears from the eye into the nose, and therefore to be carefully distinguished from the superabundant lacrymal secretion styled *epiphora.*

Symptoms. While the puncta stand widely open, the canaliculi are dilated, and appear to have lost their natural contractility of texture, and absorbing power, the consequence of which is, that a tear constantly gathers on the edge of the lower eyelid, at the inner canthus, rendering vision indistinct, and requiring the constant use of the handkerchief. The quantity of tears which roll over the cheek, is not considerable; they fall in single drops, at intervals, and only from the nasal angle of the eye. The nostril belonging to the affected side is dry, as little or none of the fluids collected in the lacus lacrymarum is conveyed into the sac, there to mix with the mucus secreted by its lining membrane, and thence to be discharged into the nose. There is no tumour, nor blenorrhœa, of the sac. On injecting a little water with Anel's syringe, it flows out by the nose or down into the throat, showing that the lacrymal sac and nasal duct are in a healthy state. There is, in fact, no obstruction anywhere, only a want of action.

Causes. The causes of this atonic stillicidium are various. Erysipelatous inflammation of the eyelids, and long-continued puro-mucous ophthalmia, are apt to give rise to this state of the parts; as are the ophthalmiæ caused by small-pox and measles. Another cause of a different sort is the injudicious use of Anel's probes and syringe in the treatment of chronic dacryocystitis. Schmidt mentions two cases which fell under his observation, in which the papillæ lacrymales were absolutely split, in consequence of the repeated introduction of these instruments.

Treatment. A solution of borax in peppermint water, with a small quantity of camphorated spirits, or of tincture of opium; a solution of the sulphate of iron; or a pretty strong solution of the lapis divinus, with the same addition of spirit or of tincture, may be used. One of these, with a hair pencil, is to be applied to the relaxed puncta, and afterwards dropped into the nasal angle of the eye, several times a-day, the patient lying on his back for some minutes after the application. The tincture of nux vomica, applied in the same way, appears to be useful.

SECTION IX.—EVERSION OF THE PUNCTA LACRYMALIA.

To stillicidium lacrymarum, arising from displacement outwards of the puncta, especially of the lower one, so that the tears no longer reach the orifice, attention has been particularly directed by Mr. Bowman.[1]

The displacement of the puncta from ectroprum has already (p. 197) been noticed. It is only a slighter degree of this same displacement which Mr. Bowman has minutely described, and for which he has proposed a peculiar mode of treatment. In the cases in question, the lid is either in natural contact with the globe, or only slightly recedes from it in certain positions, as when the eye is turned upwards. The natural prominence on which the punctum is placed is, however, wanting, and instead of it, there is a flattened or rounded cutaneous surface, on which the orifice may be discerned at a little distance from the mucous surface of the lid, dry and contracted, being in fact never touched by the tears.

Two causes of this displacement of the punctum are noticed by Mr. Bowman: the one, a slight chronic inflammation of that part of the conjunctiva lying near the punctum, producing thickening and consequent eversion; the other, a chronic cutaneous affection of the lower lid, by which a general but moderate contraction of it is produced, and the punctum is drawn outwards.

As a consequence of its displacement and exposure, the mucous surface on the inner side of the punctum has lost its natural character, and has become cuticular, so that the tears are prevented from coming up to it, and do not wet it, but collect in a drop at the caruncle, and roll over on the cheek.

For the relief of such cases, Mr. Bowman has been led to propose the slitting up of the lacrymal canal, from the punctum towards the caruncle, for a length sufficient to carry the absorbing orifice inwards to that part of the conjunctival surface where the tears collect. He finds that the part of the canal which is slit up, extending to perhaps $\frac{1}{8}$ inch, is converted into a groove, the edges of which after a little time show no disposition to re-unite, while the tears find their way from this groove along the remaining part of the canal into the sac, to the complete removal of the stillicidium.

The operation is performed on a probe, introduced by the punctum, and for some days the tendency to re-unite must be prevented, by breaking through any adhesions which may form in the divided part of the canal. No visible deformity results from the operation. It is adapted not only for the cases described, but also for those in which ectropium having been cured by the means formerly mentioned, stillicidium still remains, the punctum continuing a little displaced, or surrounded by tumid tissue, and irreparably altered in structure.

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[1] Medico-Chirurgical Transactions, Vol. xxxiv. p. 337 ; London, 1851.

SECTION X. —OBSTRUCTION OF THE PUNCTA LACRYMALIA AND CANALICULI.

The puncta are sometimes congenitally absent. This may or may not be attended by defect of the lacrymal canals.

Cases occur in which the puncta are obliterated from burns, and from inflammation or ulceration. In a case of this sort, occurring after small-pox, the corresponding canal was dilated to the size of a pea, a muddy fluid escaping from it when I punctured it. Such causes as have now been mentioned, as well as mechanical injuries, may obliterate portions, more or less extensive, of the canaliculi.

In other cases, the puncta are contracted, but are still patent, and being dilated with the point of a middle-sized pin, Anel's probe will pass through them without difficulty. This state is attended with stillicidium, sometimes with paleness of the semilunar fold and caruncle, and occasionally a dry, almost horny state of the latter; a complication which is very unfavourable. The stillicidium is always less when the patient remains within doors. It is more troublesome during cold wet weather. Lotions and salves are prescribed in vain; nor does the frequent passing of Anel's probe afford relief. Fomenting the eyes with warm water, and the use of goggles, moderate the complaint.

A frequent cause of obstruction of the canals is tumefaction of their lining membrane, continuing after all the other symptoms of acute or chronic dacryocystitis have disappeared.

If the sac has been laid open by an incision, or if a fistula of the sac has formed, neither the artificial opening nor the fistula is to be healed up, till we be assured of the healthy state of the lacrymal canals. The state of the canals is also to be ascertained on the day following the opening of a mucocele.

It is our object to ascertain, not merely whether the lacrymal canals be obstructed, but also the cause of their obstruction. This may depend upon the presence of inspissated mucus, tumefaction of their lining membrane, stricture, or absolute obliteration in a part or throughout the whole of their extent.

For the examination of the canals we make use of Anel's probe, which is to be introduced in the manner described at p. 268. If, upon continuing to press the probe onwards, it enters the sac, so that we come to touch the nasal side of that cavity with the point of the instrument, we are assured that there is no obliteration of the canals. If an obliteration exists, a state of the canals which we may partly suspect beforehand from the contracted appearance of the papillæ and puncta, we find an unconquerable obstacle to the passage of the probe, and ascertain at once the extent and situation of the obliteration. In some cases, the obstruction is close to the sac, so that if the probe is pressed on, the outer wall of the sac, with the skin over it, is moved towards the nose, and we feel an elastic resistance. If there is no such stoppage, so that the probe enters the sac and comes into contact with its inner wall, the skin over it is not moved. Mr. Bowman suggests[1], that as the distance between the punctum and the inner wall of the sac when the canal is stretched by drawing the lid outwards, is just ½ inch, a probe covered with gold for that length would assist in determining whether the sac has actually been entered.

If the presence of mucus in the canals is the sole cause of the obstruction, the conveyance of the tears will be immediately restored by carrying the probe onwards into the sac. When there is tumefaction of the mucous membrane, the conveyance of the tears is not restored by merely sounding the canals; for as soon as the probe is withdrawn, the contraction of their calibre returns. Such tumefaction, indeed, depends in every case upon inflammation, and consequently will sub side only as this disappears.

When one or both of the canals are contracted or obliterated through a small part of their extent, for instance, less than the length of a line, we ought to endeavour to force the probe, but not violently, through the stricture or obliteration, into the sac. If it passes, the edges of the eyelids ought to be kept moist, for some days after, with a thin and mild ointment, and the probe passed daily along the canal into the sac.

When a complete obliteration of the canal, whatever be its origin, does not extend beyond a line or two from the punctum, Jüngken's[2] operation may be tried. The lid being drawn outwards and away from the eyeball, with scissors he removes a stripe of the edge of the lid, including the obliterated portion of the canal. After the bleeding has ceased, he introduces a bristle, afterwards a fine catgut, and lastly a fine piece of leaden wire, retaining this last till cicatrization takes place, which is in the space of seven or eight weeks. The new punctum, although nearer the inner commissure, conveys the tears prefectly into the sac. In this way, Jüngken operated successfully on a young man who, in consequence of a burn, had a closed canal, with union between the commissure, the caruncle, and the semilunar fold.

It seems not unlikely that in Jüngken's operation the canaliculus may have been cut obliquely; a circumstance much in favour of success; for, as Mr. Bowman has observed[3], were the division transverse, a slight contraction in the circular direction would close the canal, whereas when it is longitudinal or oblique, a corresponding amount of contraction of the divided wall could not close, or even much contract, the entrance to the canal.

Mr. Bowman does not interfere with the obliterated portion of the canal; but, in those cases in which the obstruction is sufficiently far from the sac to allow of the canal being slit up in the interval, he proposes in one or other of the following methods to restore the course of the tears: the one is, by cutting transversely across the canal, close to the obstruction, on the side towards the sac, and then slitting up the canal and the conjunctiva on a probe introduced at the wound; the other method is, supposing no orifice can be found after this transverse section, to open the sac below the tendon of the orbicularis, run a probe from the sac into the canal as far as the obstruction, and then slit up the canal on the probe, through the conjunctiva, and near the caruncle. To execute the second method, the surgeon must previously take pains to acquaint himself with the anatomy of the parts. In the dead subject, Mr. B. had found it easy to pass the probe from the sac into the canaliculus.

When the canals are completely obliterated, it has been proposed to make new puncta and canals, by carrying a thread, or making an incision, into the sac; but such artificial passages close as soon as the seton or the bougie ceases to be inserted.

In such cases, it has been recommended to lay the sac completely open, apply caustic to its lining membrane so as to excite a degree of inflammation, and then, by compression, endeavour to secure the obliteration of its cavity, or to dress it for some time with strong red precipitate ointment, and gradually allow it to contract and close. These means are for the purpose of preventing abscesses of the sac, or the formation of mucocele.

To free the patient from the stillicidium lacrymarum otherwise attendant on obliteration of the canaliculi, the lacrymal gland may be extirpated, as was done by Mr. Dixon in an interesting case of injured eye, in which he had occasion also to form an artificial pupil.[4] Unless the glandulæ congregatæ, however, are also removed, tears will still continue to be secreted. Bernard first proposed extirpating the lacrymal gland, in cases of fistula of the sac and chronic lacrymation, which might seem otherwise incurable.[5]

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[1] Medico-Chirurgical Transactions; Vol. xxxiv. p. 346; London, 1853.

[2] Die Lehre von den Augenkrankheiten. p. 628; Berlin, 1832.

[3] Op. cit. p. 343.

[4] Lancet, June 25, 1853, p. 577.

[5] Annales d'Oculistique, Tome x. p. 193, Bruxelles, 1843.

SECTION XI. — OBSTRUCTION OF THE NASAL DUCT.

In suspected cases of strictured nasal duct, when there is no opening into the sac, Mejan[1], Cabanis[2], and others attempted dilatation by means of a mesh, drawn up through the duct, and into the sac, by means of a thread, previously introduced into the nostril from the upper punctum; while Anel[3], Travers[4], Jacob[5], and others, have recommended that probes and other means for removing the stricture should be passed down from the puncta, through the sac, and into the duct. Both these modes of practice have been found to be painful, dangerous, and ineffectual. They not merely fail in the object intended, but are apt to end in incurable atony of the puncta, by causing them to split, or to ulcerate, and are therefore generally abandoned. I would recommend those who feel inclined to try dilatation of the nasal duct through the puncta, to read Dr. Jacob's account of the matter. I think the difficulties and objections stated by a professed admirer of the practice will be sufficient to convince them of the futility and danger of this mode of treatment, even though attempted with bristles from the tail of a hippopotamus.

An examination of the nasal duct, equally as of the canaliculi, is to be instituted before healing up any artificial opening or fistula of the sac; also, on the day after a mucocele has been laid open.

The best instrument for examining the nasal duct is a silver probe about $\frac{1}{20}$ inch thick, and not bulbous. This is to be introduced horizontally by the opening which has been made through the skin into the sac, till it touches the nasal side of that cavity; it should then be raised into a vertical position, and its point directed downwards and a little backwards. Turning the probe upon its axis, we pass it from the sac into the duct; and as we continue to press it gently downwards, the instrument, if the duct is pervious, slides into the nose. If its point meet with some obstruction, we must not immediately conclude that there is an obliteration of the duct. We must press down the probe a little more strongly, yet without violence; turning it round between the fingers, and giving it different directions. The natural course of the duct is not straight, but somewhat curved, the convexity of the curve being directed forwards, and the concavity backwards. Should the straight probe, therefore, not pass easily, it should be withdrawn and slightly bent, to correspond to the curvature of the duct. By these means, the obstacle may frequently be overcome, and the probe suddenly descend.

If the obstacle remain as before, and feel extremely firm, still this is not sufficient ground for us to conclude that there is a real obliteration; because there are many other causes, particularly diseased states of the mucous membrane, from which the difficulty we encounter may proceed. The membrane may be tumefied, its mucous cryptæ enlarged and indurated, and thereby the calibre of the duct more or less diminished, yet these obstacles may be capable of yielding, so that by considerable pressure we may succeed in passing the probe into the nose. In other cases, the tumefaction and induration of the mucous membrane may yield so little as to render it impossible to reach the nose with a probe of the ordinary size, and it requires great patience to pass a small silver probe through the duct.

If we succeed, though it may not be without considerable difficulty and after many trials repeated during several days, in bringing a probe into the nose, which we can easily recognise by the hitting of the end of the instrument against the floor of the nostril, as well as from the sensation experienced by the patient, we remain convinced that it is yet possible to restore the whole excretory apparatus of the tears to the exercise of its function.

Though the nasal duct does not exceed $\frac{2}{3}$ inch in length, there are three points in its course at which stricture is particularly apt to occur. One of these is exactly where the sac ends and the duct begins. The calibre of the duct is frequently narrowed there by a circular fold, the thickening of which will cause obstruction. Janin[6] details the appearances upon dissection of a stricture in this situation, and describes the mucous membrane of the duct as presenting a plaited appearance like the sleeve of a shirt at the wrist. A second fold of the same kind occurs[7] in the middle of the duct, in many subjects, though not in all; and hence this part becomes from a similar cause the frequent seat of stricture. The third, and most frequent situation of stricture, is at the termination of the duct in the nostril.

In order to treat of the restoration of the nasal duct with precision, I shall consider three different cases. The first is when we have already passed a probe through the duct. The second is when we do not at first succeed in passing a probe, but in which it is yet possible to pass it. The third case is when it is impossible to pass any probe through the duct.

First case. If we have succeeded with the silver probe, we ought immediately to introduce a style of the same size, and about 1¼ inch long into the duct. We now proceed progressively to restore the duct to its natural calibre. This may be done by a series of silver styles, or of catgut, gum-elastic, or wax bougies, introduced from the sac; by a long piece of catgut, entered by the sac and drawn out by the nostril; or by a seton, or mesh of silk threads, drawn up from the nostril.

If we prefer the mesh, we introduce, by the opening into the sac and down the duct, a bit of fine catgut, having a strong doubled silk thread fastened to its upper extremity. The catgut is to be pushed well down into the nostril. In the course of a day or two, sometimes in a few hours, the lower end of the catgut, having become soft, may be forced out of the nostril by blowing the air through it, with the opposite nostril shut. The catgut is then to be drawn out, followed by the doubled silk thread, the catgut is to be removed, and into the loop of the silk thread a mesh is to be placed, formed by another thread, doubled several times upon itself, and long enough to hang out of the nostril. The upper end of the first thread, where it projects through the opening into the sac, is now to be laid hold of, and drawn slowly upwards, till the mesh is introduced into the nasal duct. The first thread must now be coiled up, the coil laid upon the side of the nose, and covered with a bit of court plaister, while the lower end of the mesh is to be turned round and fixed in the same manner to the ala nasi. After a few days, having loosened the upper end of the first thread, and the lower end of the mesh, from these attachments, we lay hold of the latter and pull it downwards, till it is fairly out of the nostril, and the looped lower extremity of the first thread again brought into view. The mesh is now to be withdrawn, and a thicker one being introduced into the loop of the thread, is to be drawn up into the nasal duct; and in this way a succession of meshes s to be employed, till the necessary dilatation is accomplished. One dvantage of this method is, that the mesh, being introduced into the duct from its lower orifice, the opening into the sac is allowed to ontract to a small size.

For dilating the nasal duct, Beer, after Richter, employed the ommon catguts of the violin. Beginning with the string E, having oftened its point between the teeth, made seven or eight inches of it erfectly straight, and dipped it in a little oil, he introduced it into he sac, and thence into the duct. He pushed it down slowly, till ve or six inches of it had descended, in order that its inferior extremity might be drawn forth from the nostril without difficulty, a part f the operation which was left to the patient. The superior part of he catgut was coiled up, enclosed in a piece of linen, and fastened under the hair of the forehead. Into the opening of the sac a little lint was laid, and over that a piece of court plaister was applied.

The patient was directed to try, after two or three hours, to bring the inferior end of the catgut out of the nose, by shutting his mouth and the opposite nostril, and driving the air through the nostril into which the catgut had descended. When he felt it advance, he drew it out of the nostril, turned up its extremity to the side of the nose, and fixed it there by a slip of court plaister.

On the following day, the lint was removed from the opening of the sac, and a quantity of one of the collyria, which will be afterwards enumerated, was injected by the side of the catgut, as well to wash away any mucus accumulated in the sac, as to act upon the mucous membrane. The superior end of the catgut was now loosened from the forehead, a sufficient fresh portion undone from the coil, and being besmeared with one of the substances which I shall mention, drawn into the duct by the patient taking hold of the extremity which hung from the nose. The portion of catgut which had been used during the preceding day, was now cut off, and the new end turned up to the side of the nose, and there fastened as before. The same injection was now repeated, the lint and plaister applied to the opening of the sac, and the coil of catgut bound up.

In this manner Beer proceeded, day after day, till the catgut E was completely used. Before passing a new catgut, the point of a syringe was introduced through the sac into the duct, and a quantity of tepid water coloured with vinous tincture of opium, injected; care being taken to observe whether any part of the fluid was discharged by the nostril.

The string A was now passed as E had formerly been, and its use continued exactly in the same manner. When it was finished, the injection of a coloured fluid was repeated, in order to ascertain what progress had been made in restoring the natural diameter of the duct.

The string D followed. After its use, the injection was almost constantly found no longer to drop merely, but to flow freely from the nostril. Were this not the case after the employment of one D, this catgut was repeated till the injection was discharged from the nose in a full stream. Then, and not till then, the treatment was brought to a close.

If the mucous membrane of the duct, when the use of the catguts was commenced, was merely somewhat tumefied, and opposed no great obstacle to the probe, the portion of catgut daily introduced was moistened with the vinous tincture of opium, and a quantity of the solutio lapidis divini made lukewarm was injected by the sac. (See Formulæ). The lint, too, with which the wound of the sac was dressed, was dipped in the vinous tincture of opium.

If the tumefaction of the mucous membrane was firm, so that the silver probe could not be brought into the nose without much opposition, the catgut was besmeared with citrine ointment, at first very much diluted, but gradually increased in strength. The same ointment was applied to the wound. For an injection in the same case, a solution of corrosive sublimate was employed, together with some vinous tincture of opium. If the cryptæ of the mucous membrane were indurated and enlarged, so that the probe was felt passing successively over a number of little knots, a weak ointment of red precipitate was employed for besmearing the catgut, and the patient was directed, daily, before the catgut was drawn, to rub in a small quantity of camphorated mercurial ointment around the opening of the sac.

Similar applications may be used, if we prefer bougies, or silver styles, for restoring the nasal duct to its natural calibre. Dr. Parrish recommends bougies made by dipping a piece of fine linen into melted white wax, suddenly withdrawing it and allowing it to cool, then cutting it into portions, and rolling them tightly into the form of small cylinders. Such a bougie may be cut or bent with ease, and be made smaller by unwrapping, without the necessity of having a number of sizes already prepared.[8] Whatever instrument we select, its employment must be continued for several months, and the wished-for restoration effected very gradually; knowing that if we remove the stricture or obstruction suddenly, it will almost to a certainty return.

When we consider ourselves warranted to discontinue the dilating instrument, we may try the experiment of dropping a deeply coloured fluid into the lacus lacrymarum, observing whether it appears at the opening into the sac; for the little valvular fold which in many subjects covers the opening of the canals into the sac[9], is apt to become closed from the long-continued pressure of a foreign substance. Should the valve be shut, it must be forced open by the Anelian probe passed through the canals.

The wound of the sac is now to be dressed, once a-day, with plain lint. The coloured fluid is to be daily injected. If for fourteen days successively it flows in a full stream from the nose, we proceed to close the wound. We make its edges somewhat raw with the lancet, and then bring them together with adhesive plaister.

Second case. If the silver probe sticks fast in the duct, we may leave it there till next day, fastening it to the forehead by a proper bandage, closing the opening of the sac with a little lint, and applying over the lint a piece of court plaister. For a week we ought not to despair of overcoming the obstruction, not by main force, but by gentle and daily repeated endeavours to get the probe a little and a little farther through the duct, turning the instrument on its axis at every trial, and varying the direction of the pressure. If we succeed in this manner, we continue the treatment as has been explained under the first case. If we fail, this second case must be treated as the third.

Third case. If the nasal duct be in part obliterated, recourse must be had to perforation, by means of a small triangular or trocar-shaped probe. If the extent of the obliteration be inconsiderable, this perforation may be performed with a confident hope of success. A few drops of blood flow from the nose on the perforation being effected. The probe is immediately to be withdrawn, and a small silver style introduced. This remains for a day or two, and then the very gradual dilatation of the duct, which has already been described, is to be commenced.

If a considerable portion of the duct, or even its whole extent, be obliterated, the same operation ought to be attempted. This is done with at least equal hopes of success as if we perforated the os unguis. It is true, that the new passage would probably close, after our dilating instruments were laid aside. In this case, then, the introduction of a gold tube or style into the duct, to be left for life, is peculiarly indicated. The surrounding substance will contract upon the tube or style, and render it less liable to be displaced than a similar instrument passed into the natural calibre of the duct.

In strictured or partially obliterated nasal duct, recourse may sometimes be had, with advantage, to the use of a small bougie, armed with caustic. A probe with a dimple in its point, into which a speck of lunar caustic, or potassa fusa, is to be placed, will answer the purpose. This may be applied from time to time, exactly as we employ the same means in stricture of the urethra, introducing the bougie from the sac down into contact with the strictured or obliterated part of the duct, keeping it there for a minute or two, and after withdrawing it, injecting the duct with tepid water. In both Germany and France, this plan has been employed with success.[10]

All other plans failing, there still remains the perforation of the os unguis. The only reason why such an operation should not be totally abandoned is, that if no passage is obtained from the sac into the nostril, the patient will be exposed to perpetual attacks of inflammation in the sac, which will give rise to much distress, and to the formation of fistulæ. In such a case I have seen attempts made to obliterate the sac, by laying it completely open, and dressing it with escharotics. It is much more difficult to obliterate the sac in this case, than in that which I have described at page 286. Indeed, obliteration will not be obtained, unless we manage permanently to close the apertures of the lacrymal canals into the sac. If these remain patent, the tears flowing through them will gradually re-dilate the sac. Under such circumstances, Bernard's plan of extirpating the lacrymal gland might be adopted; or the canaliculi might be cut across, after which the apertures next the sac will close, so that the tears will not reach the sac.

Besides the presence of foreign substances in the nostril, which sometimes become the nuclei of calcareous concretions[11], and the pressure caused by polypus nasi, there is another cause of obstructed nasal duct, of a formidable nature, which I must notice before leaving this subject; namely, exostosis of the osseous passage through which the duct descends. "I have found," says Mr. Travers, "the canal completely obliterated by ossific inflammation at its upper orifice in skulls."[12]

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[1] Mémoires de l'Academie Royale de Chirurgie; Tome v. p. 111; 12mo; Paris, 1787.

[2] Ibid.

[3] Traité de la Nouvelle Méthode de guerir la Fistule Lacrymale; Turin, 1713.

[4] Synopsis of the Diseases of the Eye, p. 372; London, 1820.

[5] Dublin Hospital Reports; Vol. 5, p. 381; Dublin, 1830.

[6] Mémoires et Observations sur l'Œil, p. 115; Lyon, 1772.

[7] Soemmerring, Abbildungen des menschlichen Auges, p. 32; Frankfurt am Main, 1801.

[8] Dublin Journal of Medical Science; vol. xxxiv. p. 516; Dublin, 1844.

[9] Rosenmüller, Partium Externarum Oculi Humani Descriptio; § 125; Lipsiæ, 1810.

[10] Harveng, Archives Générales de Médecine; Tome xviii. p. 48; Paris, 1828

[11] Kersten, De Dacryolithis, seu potius Rhinolithis, in Radius, Scriptores Ophthalmologici Minores; Vol. iii. p. 145; Lipsiæ, 1830.

[12] Op. cit. p. 243. See case of Exostosis of the Os Unguis, operated on by Dr. Krimer, in Gräfe und Walther's Journal; Vol. xii. p. 156; Berlin, 1828.

SECTION XII. — DACRYOLITHS, OR LACRYMAL CALCULI, IN THE EXCRETING LACRYMAL PASSAGES.

We have already spoken (pages 106 and 234) of calculi deposited from the tears, and lodged in the lacrymal ducts and in the sinuses of the conjunctiva.

The lacrymal canals are sometimes obstructed by similar depositions. "In more than one instance," says Mr. Travers, "I have turned out a considerable quantity of calcareous matter wedged in those ducts, like the calculi of the salivary ducts."[1]

In such cases, the canal in which the calculus is lodged, is much dilated, and gives out a turbid or purulent discharge. A tumour forms, which projects both towards the skin and towards the conjunctiva. The concretion is felt with the probe passed by the punctum, and is to be removed by laying open the canal through the conjunctiva, avoiding the punctum.[2]

The sac is also the occasional seat of such concretions; more rarely, the nasal duct.

Tuberville tells us of a saddler's daughter, who had an impostume, which broke in the corner of one of her eyes. Out of it there came about thirty stones as big as pearls; after which she had a fistula, which he cured.[3]

Dr. Krimer relates the following case:—

Case 179.—A woman had for nine months been affected with disease of the excreting lacrymal organs. The sac was swelled, hard, and upon the most prominent part of the tumour, which was red and painful, there was a small ulcer which penetrated into the sac, and discharged pus, mixed with tears, especially on pressure. The nasal duct appeared entirely obliterated. When, in order to re-establish it, Dr. Krimer endeavoured to introduce a pointed probe, he withdrew on its extremity a concretion of the size of a small pea, the removal of which left the canal entirely free, and the fistula was promptly cured. The calculus was ash-gray, covered with thick mucus, polished, of a calcareous appearance, and insoluble in water, alcohol, and weak vinegar. Dr. Krimer thinks that it was formed in the lacrymal sac, by inspissated mucus.[4]

It is remarkable, as Walther has observed, that these depositions do not occur in cases of dacryocystitis, even when the nasal duct is completely obstructed.

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[1] Synopsis of the Diseases of the Eye, p. 238; London, 1820.

[2] See case by Desmarres, Annales d' Oculistique; Tome vii. p. 150; Bruxelles, 1842. Case by Syme, Monthly Journal of Medical Science, October 1845, p. 278. Cases by Crichett and Haynes Walton, Medical Times and Gazette, October 22, 1853, p. 423.

[3] Philosophical Transactions, No. 164: or Lowthorp's Abridgment; Vol. iii.; Pt. i. p. 40.

[4] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. x. p. 597; Berlin, 1827. See a Case in Sandifort's Observationes Anatomico-Pathologicæ; Lib. iii. p. 74; Lugduni Batavorum, 1779.

SECTION XIII. — POLYPUS OF THE LACRYMAL SAC.

Case 180. — A woman, aged 32, of delicate constitution, had for four years been subject to catarrh, whenever she exposed herself to cold. After some time, she became affected with a great degree of dryness of the eye, followed by inflammation extending from the Schneiderian membrane, along the nasal duct, to the lacrymal sac. The dacryocystitis being neglected, an erysipelatous inflammation of the lower lid and side of the face succeeded, with a large lacrymal tumour, which did not suppurate. The tumefaction of the lid and face went off; but a hard swelling remained in the lacrymal sac, on pressing which, puriform mucus was evacuated by the nostril and by the puncta. For three years, the patient suffered from relapses of the dacryocystitis, but the sac never suppurated. For six months, the sac could not, as formerly, be emptied by pressure, and the patient now felt with her finger a round hard tumour, distinct from the rest of the swelling. When she came under the care of Professor Walther, this tumour equalled in size a small filbert. It was round, moveable, hard, and not affected by compressing the sac. He suspected it to be a polypus.

On laying open the sac, a large quantity of puriform mucus, mixed with tears, was discharged. The polypus then came into view, it was laid hold of with a pair of forceps, drawn out, and its pedicle divided with the scissors. The nasal duct was found to be obstructed, and to restore it, a mesh was introduced, by means of which the patient was perfectly cured in three months.[1]

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[1] Radius, Scriptores Ophthalmologici Minores; Vol. ii. p. 139; Lipsiæ, 1828. See Case of Lacrymal Polypus, by Janin; Mémoires et Observations sur l'Œil, p. 299; Lyons, 1772.

CHAPTER VII.

DISEASES OF THE OCULAR CAPSULE, AND OF THE AREOLAR AND ADIPOSE TISSUES OF THE ORBIT.

TENON[1], Dalrymple[2], Bonnet[3], and O'Ferrall[4] have described the eyeball as surrounded by a capsule of condensed areolar tissue, which excludes it from contact with the fat of the orbit, while it affords passage to the six muscles of the eyeball on their way to their insertions. It would be difficult to reconcile the differences in the descriptions of the ocular capsule given by these authors. As to the reality of such a structure, there can be no doubt. It is easily displayed, in the dead body, by the method pointed out by Dr. O'Ferrall, which is to divide each eyelid vertically in the middle, turn the four flaps back, divide the conjunctiva all round at its angle of reflexion, and then with a probe separate the areolar tissue which slightly connects the eyeball to the capsule which envelops it. Without any further division of parts, the six muscles are seen perforating the capsule, to reach the eyeball. In this mode of displaying the capsule, it is brought into view as far forward as the angle of reflexion of the conjunctiva. It is generally acknowledged that the capsule is traceable into the eyelids. Without denying this, it is, I think, certain, that the thin cellular web, described by Mr. Lucas[5] under the name of the *subconjunctival fascia,* is also a production of the capsule, so that this structure, having reached the angle of reflexion of the conjunctiva, may be regarded as splitting into two layers, the one continued on to the tarsi, and the other advancing towards the cornea.

It would evidently be important to distinguish those diseases which have their seat within the ocular capsule, from those situated exteriorly to this structure. This Dr. O'Ferrall has attempted to do. He conceives that effusions and tumours situated within the capsule will project the conjunctiva round the cornea, and obliterate the fold of conjunctiva between the eyeball and the eyelid, while the same diseases situated externally to the capsule will show themselves more towards the margin of the orbit, and, in the upper eyelid, will affect that portion of it which is above the transverse fold caused by the action of the levator. If a tumour be situated externally to the capsule, there is nothing to prevent its advancing forwards as it enlarges, and thus becoming more and more superficial; if within the capsule, and bound down by it, the swelling will necessarily appear as if placed on the surface of the eyeball itself.

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[1] Mémoires et Observations sur l'Anatomie, la Pathologie, et la Chirurgie, et principalement sur l'Organe de l'Œil, p. 193; Paris, 1816.

[2] Anatomy of the Human Eye, p. 248; London, 1834.

[3] Dublin Medical Press, March 3, 1841, p. 133.

[4] Ibid. March 10, 1841, p. 158: Dublin Journal of Medical Science, Vol. xix. p.336.

[5] Practical Treatise on the Cure of Strabismus, p. 24; London, 1840.

SECTION I.—INJURIES OF THE ORBITAL AREOLAR TISSUE.

Penetrating wounds, by the side of the eyeball, even when they do not appear to implicate any of the muscles or other important parts, are apt to be followed by severe phlegmonous inflammation, and even loss of sight.

Case 181.—Two children being at play, one of them shut himself up in a room, and excluded the other. Piqued at this, he who was without, took a stick about the thickness of a writing pen, and observing that he who was within the room looked through a small hole in the door, drove the stick with such violence at him, that he buried it to the depth of two finger-breadths between the globe of the eye and the nose. The stick broke across; and as the mother did not know what had happened, a day or two passed without any thing being done, till swelling and inflammation of the eye and neighbouring parts supervening, medical advice was called in. The swelling was now so great, that it was with difficulty the bit of stick could be perceived, and it required great force to extract it with pincers. It had entered so much the more easily, as it was very slender at its extremity, and it was now swollen by remaining so long in the orbit.

The extraction being accomplished, the patient was twice bled, and soon recovered. The eyeball seemed to have suffered neither internally nor externally; yet it had entirely lost the power of vision.[1]

Case 182.—A soldier was wounded by a bayonet, which penetrated into the orbit without injuring the eye. The symptoms which ensued were trifling, until the patient contrived, three days afterwards, to absent himself for 24 hours, and get drunk. On his return, the eyeball was protruded, the lid could not be raised so as to expose the eye, which was highly inflamed; chemosis had taken place, vision was indistinct, the iris discoloured, the pupil contracted; the pain was excruciating both in the eye, which felt as if too large for the orbit, and all over the forehead and temple of that side; flashes of light of various colours darted through the eye, in consequence of the surrounding pressure. The swelling increased, delirium came on, and an abscess burst in the upper eyelid on the fourth day, without any alleviation of the symptoms. The patient soon afterwards became comatose, and died, probably from the formation of matter within the cranium. Before death, the eye had been lost by sloughing of the cornea.[2]

Foreign bodies penetrating into the orbital cellular substance, may lodge there for a great length of time, the skin or the conjunctiva sometimes healing over them, while in other cases, the wound assumes a fungous appearance, and presents a sinuous opening communicating with the place occupied by the intruding substance.

Case 183.—A gentleman's horse, in hunting, came down in going over a hedge, and the rider fell into a stubble-field. Some sharp-pointed substance, whether a piece of the hedge or a straw, he could not tell, entered close to the caruncula lacrymalis, between the eye and the orbit. He thought he himself withdrew the whole of it at the time. Leeches were applied to subdue the inflammation. When he placed himself, three months afterwards, under the care of Dr. Robertson, of Edinburgh, this gentleman found a number of small fungous granulations close to the caruncle, which the different practitioners, under whose care he had previously been, attempted to destroy by caustics, the knife, &c. There was also some discharge of purulent matter. On feeling minutely the parts, there appeared to be a sort of fibrous hardening, of the nature of that forming the sides of a fistulous passage, leading backwards to the posterior part of the orbit. Believing that there was some foreign body keeping up the discharge, and not being able by the probe to discover any passage, Dr. Robertson made an incision in the hardened part. A piece of straw nearly an inch long was discharged, afterwards a second and a third portion, when the patient perfectly recovered.

A foreign substance, such as a bit of wood or a piece of tobacco-pipe, driven through the conjunctiva and lodging in the orbit, may cause a large abscess, which will point either through the conjunctiva or through the skin. The opening by which the pus is discharged, either spontaneously or by the lancet, is carefully to be examined with the probe, so that any foreign body that is present may be detected and removed. The patient has often no suspicion of the presence of any foreign body.[3]

The danger of penetration of the walls of the orbit can scarcely be overlooked in cases of this sort; but the following instance shows how the most serious effects may be produced, although the walls of the orbit remain completely intact.

Case 184. — Michael Walsh, an Irish lad, 15 years old, and employed as a bricklayer's labourer, quarrelled in the beginning of January 1832, with one of his countrymen, whilst sitting at the same table, in a public-house. During the heat of the argument, his opponent, who sat opposite to him, thrust a common clay tobacco-pipe into the lad's eye, and made, apparently, a very deep wound. For several days, nothing was thought of the event, and but little, if any, inconvenience experienced by the boy. About the 8th or 9th day, however, his appetite was perceived to fall off; he became languid and feverish, and had frequent rigors, followed by severe pain of the head, especially of the sinciput. He applied at the Westminster Ophthalmic Hospital, and a portion of tobacco-pipe, about two inches in length, was extracted from the orbit by Mr. J. R. Alcock. The boy was copiously bled and purged, but his sufferings continued to increase; the sight of the affected eye was lost; he became delirious; an urgent irritative fever succeeded; and it was inferred that suppuration was taking place within the cranium.

In this state the lad was sent to the Westminster Hospital, on the 11th of January. He was sensible only at short intervals, and appeared to be suffering the most excruciating pain; he was continually moaning and rolling his head from one side to the other or holding it fixed in a state of apoplectic insensibility. His pulse was 140, small, irregular, feeble; bowels acting imperfectly; skin of variable temperature. He had been bled to the utmost verge of prudence, and the only means that could be judiciously employed were merely palliative. His respiration became hurried; and at times laborious and stertorous, presenting nearly an apoplectic character. Blood was taken, after his admission, from the temporal artery, but no improvement was observable. The affected eye and its appendages were much swollen, but the wound was scarcely perceptible. He died on the 12th.

Much interest was felt in this case, for it was imagined the pipe must have broken the orbitary process, and penetrated the anterior lobe of the cerebrum. On raising the calvaria, the membranes were found a little more injected than natural, but no other morbid appearance was discovered in the whole cerebral mass, save a little opacity of the pia mater covering the pons Varolii. This was found to be opposite a portion of discoloured dura mater, extending over the left cavernous sinus. An opening was made into this cavity, and a piece of pipe, an inch long, was discovered thrust between the nervus abducens and the carotid artery. Extensive disorganization of course prevailed throughout the whole sinus; and the existence of a foreign body of such size, in such a centre of nervous sympathy, was considered not inadequate to account for the severity of the symptoms. No extravasation, however, had taken place, no penetration of the dura mater, nor any fracture of the orbitary plate. The pipe had passed under the roof of the orbit, and entered the cavernous sinus, by the spheno-orbitary fissure. The carotid, though contracted a little in diameter at its point of contact with the intruded body, was yet sufficiently pervious.[4]

M. Baudens relates[5] two cases of musket-balls lodging in the orbital cellular substance. Extraction of one of the balls was first attempted by making an incision through the lower eyelid, but this plan was abandoned, on account of the mobility of the ball. By pressing back the eye, drawing forward the lower lid, and introducing a curette behind the ball, it was at last extracted.

When amaurosis instantly follows a penetrating wound of the orbit, while the eyeball shows no appearance of having been injured, there is reason to suspect that the optic nerve has suffered. Thus, Dr. Rognetta mentions[6] the case of a shoemaker, who became immediately blind, in consequence of being struck with an awl at the external orbital angle. He supposes the optic nerve to have been penetrated. The eyeball preserved its natural appearance.

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[1] Gendron, Traité des Maladies des Yeux, Tome i. p. 381; Paris, 1770.

[2] Guthrie's Lectures on the Operative Surgery of the Eye, p. 146; London, 1823.

[3] See case by Cunier, Annales d'Oculistique, Tome vii. p. 4; Bruxelles, 1842: Case by Secker, Medical Gazette, Vol. xlv. p. 606; London, 1850.

[4] Lancet, February 11, 1832, p. 715.

[5] Clinique des Plaies d'Armes à Feu, p. 166; Paris, 1836.

[6] Cours Public d'Ophthalmologie; Lancette Française, 3 Dec., 1836.

SECTION II. — EFFUSION OF BLOOD INTO THE ORBITAL AREOLAR TISSUE.

The effects of rupture of blood-vessels within the orbit may be more or less serious, as is shown in the two following cases: —

Case 185. — A man received a kick upon the cheek, just below the right eye, from a maniac, whom he was endeavouring to secure. The immediate consequence was double vision in a vertical direction, every object at which the patient looked appearing double, but the one image above the other. A firm swelling, caused by extravasated blood, was felt below the eye, deep in the orbit, and it was evident that the organ was somewhat pushed up, and out of its natural direction. On placing a finger beneath the other eye, and pressing into the orbit, the double vision was immediately corrected, by the axis of the sound eye being made to correspond with that of the injured one; while the symptom returned as soon as the finger was removed. The extravasated blood was gradually absorbed, and the patient, after a few weeks, regained correct vision.[1]

Case 186.—A boy, who had fallen into a ship's hold, was brought to the London Hospital, October 2, 1834, with concussion of the brain, violent contusion and swelling of the right side of the head, and protrusion of the right eye, which was fixed and motionless, the pupil dilated, and vision lost.

He gradually recovered from the concussion of the brain, while the eye gradually became more prominent. The protrusion of the globe immediately after the accident, without symptoms of cerebral compression, proved that it arose from extravasation of blood within the orbit; and the further continued protrusion rendered it probable, that the aperture in the vessel, from which the blood escaped, had not closed. The symptoms were not so acute as to indicate suppuration. As the globe became more prominent, the eye could be distinctly seen to be propelled forward at each stroke of the heart.

Pressure was made on the globe; but, after being borne for two days, it occasioned so much pain that it was abandoned. On Tuesday, November 10, just after the eye had been examined, a profuse arterial hæmorrhage occurred from the nose. Mr. Scott commanded it by pressure on the common carotid, and immediately secured that vessel. The protusion of the eye directly receded in a great degree, and afterwards gradually diminished.[2]

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[1] Delafield's Notes to Travers' Synopsis of the Diseases of the Eye, p. 179; New York, 1825.

[2] Medico-Chirurgical Transactions, Vol. xxii. p. 134 ; London, 1839.

SECTION III.—PHLEGMONOUS INFLAMMATION OF THE ORBITAL AREOLAR TISSUE.

Fig. Dalrymple, Pl. XII. *fig.* 3.

It has already (page 121) been stated, that erysipelatous inflammation sometimes spreads from the eyelids to the areolar tissue of the orbit, and terminates there in diffuse abscess. The areolar tissue which envelops the muscles and nerves of the orbit, and by which the eyeball is supported, is also subject to acute phlegmonous inflammation, ending in suppuration, and forming one of the most severe and dangerous affections of the organ of vision.

Symptoms. During the *first*, or purely inflammatory *stage*, pain is felt, deep in the orbit, rapidly increasing in severity, and extending to the forehead and temple. The pain is of neuralgic character, and intermittent. The eye is soon observed to be more prominent than natural. The patient feels as if it were constantly pressed upon, or as if the orbit had become too small. The pain is greatly increased by touching the eye, or attempting to move it. The patient is distressed by the sensation of flashes of fire in the eye. Vision begins to fail, from the pressure exercised on the eyeball by the inflamed and tumefied parts by which it is surrounded, from the inflammation spreading to the optic nerve and its envelope, and from the nerve being put on the stretch by the projection of the eyeball forwards from the orbit. The conjunctiva becomes red and chemosed. In some cases the pupil is contracted, and the eyeball partakes in the inflammation. This, however, is by no means constantly the case; matter may even form behind the eye, and yet its proper textures remain apparently uninjured. When they do inflame, the iris becomes discoloured and motionless. The secretion of tears is soon checked, from the lacrymal gland taking part in the inflammation, but till then there is epiphora. The eyelids are red, painful, and swollen, as if affected with erysipelas, and move with difficulty. The disease is apt to be mistaken for erysipelas of the lids; and nothing effectual being attempted, the patient may perish from deep-seated orbital abscess, inducing coma. The symptoms of inflammatory fever attend these local appearances. The pulse is hard, full, and frequent. The face is flushed. The patient is thirsty, his skin hot, he is restless, and often delirious, especially during the night. The inflammation may extend to the membranes and substance of the brain, and then we have the usual symptoms of phrenitis.

In the *second stage*, matter having formed behind, or to one side of the eyeball, this is still more protruded, and is more or less distorted. It is sometimes so much thrust out, as to project beyond the eyelids, pushing them aside, and presenting the displacement called *exophthalmos.* The matter generally presses forwards to the front of the orbit, and fluctuates behind the conjunctiva, or between the edge of the orbit and one or other eyelid. In some cases, there are several points of fluctuation; one perhaps under the conjunctiva, and another behind one or other eyelid. In one case, which I saw at the Glasgow Eye Infirmary, the matter burst through the conjunctiva, by the upper-inner side of the eyeball, and appeared as if coming from within the sclerotica, while another aperture formed through the upper eyelid, under the middle of the superciliary ridge. The eye was saved. If there is only one point of fluctuation, it is reasonable to conclude, that suppuration has taken place only on one side of the eye. The eyeball, in this case, is thrown forwards in an oblique direction. Not unfrequently the eyeball falls into the state of *exophthalmia,* that is, it is not only protruded, but at the same time destroyed by inflammation and suppuration. The photopsia continues, the delirium increases, the pain becomes more distinctly pulsative, and is of agonizing severity. Matter is seen behind, and in the substance of the cornea, which after a time bursts, and allows the humours to be evacuated. Vision is totally destroyed. Even when the eyeball has not suffered much in texture from the inflammation, the retina is left in a state of insensibility. In some cases, apoplectic and fatal symptoms occur before the abscess is so much distended as to point externally. Rigors generally attend the second stage.

If this disease be neglected or mistreated, the inflammation may spread not only to the eyeball, but (See page 33) to the periosteum and bones of the orbit, or the matter may make its way into the nostril, the maxillary sinus, or even the cavity of the cranium.

Although, in general, inflammation of the orbital areolar tissue is an acute and rapid disease, it, in some cases, assumes a chronic form, so that, slowly, in the course of months or years, and sometimes without pain, matter accumulates within the orbit. At length the lids become swollen, red, and everted; the eyeball protrudes; fluctuation is felt; the abscess bursts, and leaves a sinus which is apt for a great length of time to discharge matter, even when there is no affection of the bones.

From the indurated and adherent state of the areolar tissue, consequent to orbital abscess, the eyeball may remain permanently protruded and motionless. In this case, the tears run over the cheek, the eyelids cannot close, the surface of the eye becomes inflamed and tender, and the patient continues subject to headache, watchfulness, fever, and great anxiety.[1]

Causes. The causes of inflammation within the orbit are confessed to be, in many cases, obscure. Benedict tells us that this disease occurs for the most part in plethoric individuals, after sudden changes of temperature, and in scrofulous or otherwise disordered constitutions. Exposure to cold is often the cause. Foreign bodies thrust with violence between the edge of the orbit and the eyeball, and even slight injuries, occurring in peculiar constitutions, or under particular circumstances of the system, may bring on inflammation of the orbital areolar tissue. Thus, Weller instances a case which occurred in a healthy young woman, who happened, while in the state of menstruation, to receive a slight lacerated wound of the orbit. The fright occasioned by the injury brought on interruption of the menses, and a severe inflammation of the whole cavity of the orbit followed. The extirpation of orbital tumours sometimes gives rise to severe inflammation ending in suppuration. I have seen the same effects follow semi-extirpation of the eyeball for general choroid staphyloma.

Treatment. A vigorous antiphlogistic treatment must be had recourse to, in the first instance. Copious and repeated bleedings from the arm, a liberal application of leeches round the orbit, cold lotions to the head, free purging, abstinence, rest, and darkness, are evidently indicated. Even when the constitution is not robust, this sort of treatment must be followed, to save the vision, and, it may be, even the life of the patient. The debility arising from the use of active antiphlogistic means of cure may be removed, while a temporizing or timid plan of treatment may be productive of the most serious mischief. If the conjunctiva is chemosed, it should be freely scarified, or pieces of it cut out, which will procure a considerable flow of blood. Benedict recommends sinapisms to the neck, friction of the forehead and temple with mercurial ointment, and large doses of calomel internally.

An opening through the conjunctiva, or through the eyelid, for the evacuation of the matter collected within the orbit, is the chief point of treatment in the second stage. A deep and free incision is to be made wherever the fluctuation is discovered; and even when there is no distinct fluctuation, if other symptoms are present which lead us to conclude that in all probability matter has formed, it is safer to plunge the lancet into the part which is swollen, and where we think suppuration is likely to have taken place, than to allow the matter to accumulate, the bones perhaps to suffer, or even the brain to become affected. Of course, in opening the abscess, care must be taken to avoid the eyeball and other important parts. The incision ought to be kept open with a dossil of lint, and a poultice is afterwards to be applied. The eye is frequently to be fomented with decoction of poppies, or aqueous solution of opium. At the second or third dressing, after the abscess has been evacuated, the opening into the orbit may be cautiously examined with the probe. If it is not deep, the dossil of lint is gradually to be diminished in thickness, and pushed less into the orbit, till the sinus closes. If, on the other hand, the sinus, or sinuses are deep, running back almost to the bottom of the orbit, a mixture of eight ounces of tepid water, with one drachm of aqua potassæ, ought daily to be injected. This is to be continued till the probe is found not to pass beyond the eyeball. The lint may be introduced to this depth, and is not to be lessened till the back part of the sinus close. I have already (Chapter I. Section ii.) explained the necessary treatment in cases where the bones of the orbit are found to be affected.

If the eyeball has suffered much, so that the aqueous chambers are distended with pus, it will be proper to open the cornea; but if only a small quantity of matter is lodged in the anterior chamber, or between the lamellæ of the cornea, we may rely on this being absorbed, if the general inflammation of the eye and orbit is subdued.

If the vision of the eye is completely gone, and a greenish purulent appearance remains behind the pupil, the lancet should be plunged through the sclerotica. Perhaps only a little thin fluid will be evacuated; but by this means the tension is relieved, the eye retreats, and the life of the patient may be saved.

In four or five days after the orbital abscess is opened, all the dangerous symptoms have in general subsided, and the use of active antiphlogistic remedies may be laid aside. Easily digested food, in moderate quantities, may be allowed, and if the patient has been much weakened by the previous depletion, some such tonic may be given as is not apt to excite the vascular system.

When inflammation within the orbit assumes a chronic form, blisters to the temple and forehead are to be employed, with calomel internally till salivation is produced.

Cases. I have already stated (page 34) the principal circumstances of a case related by Demours, and referred to another by Saint Yves, in which this disease ended in extensive caries of the orbit.

Mr. Lawrence has related, with his usual clearness, two cases which fell under his care in an early stage of the complaint. "Some time ago," says he, "I saw two instances of this affection, in which the local and general symptoms were characterised by a degree of violence which I have hardly ever witnessed in any other case."

Case 187.—A man between 20 and 30 years of age came to Mr. Lawrence, accompanied by his wife, who said he had suffered such agonising pain for the three or four preceding nights, that she was afraid he would have gone out of his mind. In this case, matter was presented just under the superciliary ridge; after making a free opening, a large quantity was discharged, and upon putting in a probe, it went to the bottom of the orbit.

Case 188.—In a child between three and four years old, the local and general symptoms were equally severe; the matter presented between the lower lid and the globe, but the quantity which issued on making an opening, was not very considerable in this case. In both instances the globe of the eye was very much protruded, but not actually thrust out between the eyelids, and after the matter was discharged it receded to its natural situation. In the child, vision was restored; but in the adult, the eye, although it had not been inflamed, remained amaurotic.[2]

Mr. Ware remarks that if the suppuration be slow, and the matter lie considerably below the surface, the eye will be protruded before any fluctuation can be discovered, and the existence of the matter will only be learned by paying attention to the accompanying symptoms, such as a quick pulse, white tongue, shiverings, &c. These remarks he illustrates by the following case:—

Case 189.—In a child, six years old, Mr. Ware passed a lancet on the side of the eye next the nose, a little below the commissure of the eyelids, at least an inch into the orbit, before he reached the matter. On withdrawing the instrument, its point was evidently marked with pus. He therefore enlarged the aperture with a blunt-pointed bistoury, and discharged a considerable quantity which was thick and putrid. It was necessary to preserve the opening by the insertion of a small dossil of lint; on the removal of which, a vent was given daily to new matter for a fortnight. Its quantity gradually decreased, together with the prominence of the eye; and at length it wholly ceased, the wound healed, and the child became well. The motion of the affected eye, however, was not quite free towards the nose for several months afterwards.[3]

Case 190.—In a man, whom I had occasion to see a few times, the disease began with pain, apparently neuralgic, in the supra-orbital region, lasting daily from 8 till 10 A. M. This was followed by double vision, and the eyeball became depressed. There was no affection of the conjunctiva, but the upper eyelid was distended. These symptoms continued from December, 1840, till December, 1841. A poultice was applied, and an abscess burst through the upper eyelid, close to the edge of the orbit. The opening healed, and the eyelid again became elevated. Six months after it had burst, I plunged a lancet into it, and keeping the lips of the wound apart with a probe, discharged a large quantity of pus. The cavity stretched back, above the eye, to the depth of 1½ inch.

Case 191.—Mrs. H., aged about 56, came under the care of Mr. Espie, surgeon, at Falkirk, on the 16th April 1836, for a disease in the right orbit. She stated that about 12 years before, she received a severe blow over the right eyebrow, by coming suddenly in contact with a lamp-post. After the lapse of four years from the date of the injury, one of her relations observed a difference in the appearance of her eyes, but she herself did not discover any thing particular about them for another period of four years, when she observed that the right eyeball protruded, without any other unpleasant symptom.

The protrusion gradually increased, and was attended with photopsia, double vision, dimness of sight, and much feeling of tension. She complained greatly of a feeling of traction within the orbit.

Mr. Espie found the right eyeball protruding downwards and outwards. It appeared to rest on the orbitary edge of the malar bone. At the superior-internal part of the front of the orbit, he discovered a tumour, slightly elevated, and in which obscure fluctuation could be detected. The patient had not experienced any pain in the seat of the tumour. The eyelids, and particularly the upper, were much distended. There was no discolouration over the swelling. The patient had never experienced any rigors since the receipt of the injury. Her general health was good.

At this period, I saw the case, and advised that the tumour should be punctured, on the supposition that it was an encysted tumour.

On the 22d April, Mr. Espie punctured the tumour at its most prominent part, and gave exit to a large quantity of pus, first flaky and then healthy. This was followed by immediate relief to the feelings of tension and traction. The double vision and other symptoms also vanished. The eyeball was gently returned, to a certain extent, into its socket, and a tent being introduced through the wound, a compress and roller were applied over the front of the orbit, so as to support the eyeball.

The case continued under treatment for about six months. During the greater part of that time, on introducing a director, matter continued to be discharged by the wound, and it was necessary repeatedly to dilate the opening. On one occasion of enlarging the wound, from its becoming fistulous, the eyeball was seized with an involuntary motion from side to side, which lasted fully an hour. On introducing a probe, which passed nearly to the bottom of the orbit, no carious bone could be detected. The eyeball was ultimately restored to nearly its natural place in the orbit, and the vision of the eye was perfectly preserved.

Case 192.—Marshal the Count Radetsky, aged 70, of a vigorous constitution but liable, from the accidents of the military life, to rheumatic and catarrhal complaints, was seized, in consequence of exposure to alternations of heat and cold, with severe pain in the forehead and temples, accompanied by inflammation of the right eye, which for some time had been affected with epiphora, accompanied by partial eversion of the lower eyelid. The severe pain soon subsided; but the eyelids continued red, and the conjunctiva swollen, while a tumour became perceptible to sight and touch, pushing the eyeball from the orbit. When Professor

Jäger visited the patient at Milan, he found a tumour, not only filling the whole orbit, but extending greatly beyond it, and the eye so much protruded, and the lids so much retracted, that could they have closed, they would have done so behind the globe. The tumour on which the eyeball rested was painful to the touch, hard like a stone, unequal, and bossulated. The lids were enormously stretched in every direction, swollen, and motionless; their external colour dark livid, and their surface strewed with varicose vessels. The lacrymal gland was displaced like the globe of the eye, being pushed into the duplicature of the upper eyelid. The caruncle and sac were also greatly enlarged, hard, and painful to the touch.

Professor Jäger seems to have had some misgivings as to the nature of the case, whether it were an inflammation in the orbit which might end in abscess, or a cancerous tumour behind the eye. He seems, however, to have followed the opinion of two other medical practitioners who were in attendance, and came to the conclusion, that the disease was a malignant tumour. Luckily for the patient, this opinion proved erroneous; the case was nothing more than an abscess, which, having burst and discharged itself, the eye got well.[4]

Case 193.—In a case occurring at the Royal London Ophthalmic Hospital, under the care of Mr. Scott, with all the usual symptoms of phlegmonous inflammation of the orbit, an incision was made through the swollen conjunctiva, deep into the orbit; a sudden and most violent gush of arterial blood instantly followed the knife, and continued to issue, *per saltum*, to such a degree, as to lead to the belief that an aneurism had been opened, and the surgeon began to prepare to tie the carotid. Pressure and cold, however, arrested the hæmorrhage, and, in a few days, purulent discharge taking place, the case terminated as one of ordinary abscess of the orbit.[5]

Case 194.—An unmarried woman, aged 25, was seized with acute pain over the left half of her head, under which she continued to suffer for nearly 15 days without seeking medical assistance. At length, when the eye began to turn red and to swell, assistance was called in. The cheek swelled to a great size, and presented a rose-red colour, becoming white on pressure. The patient was affected with fever, jactitation, and anxiety. On account of the swelling and inflammation, the eyelids were so shut up, that the eyeball could not be uncovered. After some days, the swelling suppurated, and having burst spontaneously at the external angle of the eye, a great quantity of fetid pus was discharged. On pressure, pus flowed not only from the cavity of the orbit, but from the parts surrounding the eye, and from the cheek. The swelling of the eyelids and neighbouring parts soon subsided, so that the eyeball could be seen. The conjunctiva was very red, and much chemosed; but the cornea appeared bright and clear. The pupil was dilated, and the vision of the eye was lost.

On the fourth day after the bursting of the abscess, the patient was seized with a nervous fit, which subsided into complete loss of muscular power and sensation, with slow, irregular, and stertorous respiration, and a small intermitting pulse, soon followed by death.

On dissection, it was found that the whole adipose and cellular tissue under the skin of the eyelids and cheeks, even down to the lower jaw, was destroyed, and that in place of cellular substance, the space between the eyeball, its muscles, and the bottom of the orbit, was filled with fetid pus. The eyeball, and its contents, were healthy, and the cornea pellucid. On opening the cranium, the anterior lobe of the left hemisphere of the cerebrum, to the depth of the lateral ventricle, was found to be in a great measure destroyed by suppuration. The suppuration surrounded the whole optic nerve, and communicated with the cavity of the orbit. The nerve itself had not suffered, either externally, or internally.[6]

Case 195.—J. S., a shoemaker, aged 27, robust, but of irritable temperament, and given to drink, had one of the upper molar teeth on the left side extracted, on account of severe toothache. This was followed by swelling and redness of the left side of the face; and soon after there appeared, in the site of the extracted tooth, and under severe pain, a vesicle, of the size of a nut, clear like water. Ice-cold water, frequently taken into the mouth, gave relief; the pain subsided, the vesicle disappeared, and the swelling of the face became less. Some days afterwards, there was a profuse flow of tears from the left eye, which soon ceased, and was followed by a copious watery discharge from the left nostril. On the 17th April 1830, the epiphora was abundant, and attended by photophobia and by pressing, sometimes lancinating, pain in the head. Towards evening, the patient was seized with rigors, followed by heat; the photophobia and pain of the head became intolerable; the left half of the face and the eyelids became suddenly much swollen, the swelling was tense, the eyeball motionless, and sharp burning tears ran down the cheeks. The patient slept none that night, and was occasionally troubled with photopsia.

Early on the 18th, he complained of weakness, with alternate feelings of heat and cold, and great thirst. The eyelids and left cheek were more swollen and tense; the photopsia constant; and the eye deprived of vision. Fomentations and other means were tried; but the symptoms increased in severity, and after another sleepless night, on account of the severe pulsative hemicrania, the patient applied for relief, on the 19th, at the Ophthalmological Clinic in Prague.

The symptoms were intense fever, with frequent, hard pulse; constipation for three days; the left eyelids enormously swollen, elastic, dark red, and extremely painful; the eyeball was fixed, but could not be exposed to view on account of the tenseness and swelling of the eyelids; constant photopsia; pulsating pain, almost insufferable, which concentrated itself chiefly in the eyeball and was attended by a feeling of the eye being too big for the socket; the eyeball somewhat protruded; the edges of the eyelids glued together with yellowish tough mucus.

Professor Fischer bled the patient to the extent of 12 ounces, and put on 12 leeches round the eye, followed by a cold lotion, frequently renewed. Internally, a decoction of marshmallow roots, with nitre and tartrate of potash, was given in doses every two hours. The patient felt much relieved by the blood-letting and leeching, as well as by the cold application. In the evening, he seemed generally better, and had had one stool. The eye was in the same state as formerly, only the pain was less, but still pulsative. Twelve more leeches were applied, and the rest of the treatment continued. This night, the patient slept some hours.

20th, The pain in the eye had augmented, although the swelling was more confined to the eyelids, and less tense. The eyelids could with difficulty be separated from each other, so as to allow the chemosed conjunctiva to be seen; the cornea appeared natural, the pupil contracted and fixed. In the evening, the pain of the head and eye increasing, 15 leeches were applied.

During the two following days, the pain was less, and the patient had more rest during the night. The swelling of the upper eyelid affected more its inner extremity, without becoming soft or fluctuating. An emollient poultice was applied.

23rd, Fluctuation being distinct at the inner angle of the eye, the abscess was opened, and a large quantity of fetid greenish-yellow matter was discharged. The swelling fell at the inner angle, but continued unchanged at the outer angle and in the lower eyelid. The eyelids could now be separated with less pain, permitting the cornea to be seen covered with puro-mucus, the conjunctiva bulbi swollen and fleshy, and folds of the palpebral conjunctiva protruding at the outer angle from between the eyelids.

The general health became much improved, the tongue clean, appetite natural, bowels rather slow. The pain in the left side of the head was sometimes severe, and at other times seemed entirely gone. The patient passed the nights pretty quietly, he slept and felt refreshed. His mind was undisturbed. The swelling of the eyelids continued to decrease; the flow of matter was copious, and purulent shreds required often to be removed from the opening.

From the 1st till the 7th May, the patient complained only of a frequent and irresistible desire to sleep. The swelling of the lower eyelid continued; the eyeball became moveable; a prolapsus iridis had taken place through the cornea; the patient saw none with the eye. The great quantity of pus which flowed from the abscess, led to the suspicion that there was a collection of matter deep in the orbit. The patient was therefore advised to lie on the left side, or to sit with his head bent forwards, to aid the escape of the matter.

8th, Acid eructations, which ceased after the use of some effervescing powders.

9th, Somnolence; expression of countenance changed; he complained of a strong feeling of pressure in the left half of his head; retching, and vomiting of a slimy bilious fluid; skin moist; pulse slow, soft, and full; swelling fallen; discharge diminished. It appeared probable that purulent effusion had taken place within the head. Two grains of calomel, with half a grain of digitalis, were ordered every two hours. Four hours after, convulsions of the right upper and lower extremities supervened, with stertorous respiration and insensibility. The dose of the powders was increased, mercurial ointment was rubbed upon the head, sinapisms were applied to the calves of the legs and soles of the feet, and clysters with tartar emetic were administered.

On the 10th, the patient died convulsed and apoplectic.

On dissection, the blood-vessels of the dura mater were found to be much distended, and the membrane itself, where it invested the anterior lobe of the left hemisphere of the brain, was extensively discoloured, being turned to a dirty grey. The pia mater, especially on the left side, was likewise strongly injected with blood. The left anterior lobe of the cerebrum contained in its interior a great collection of pus, communicating with the lateral ventricle, which was partially filled with matter. The thalamus of the left side presented a greyish-brown colour, and soft pappy consistence; and of the same appearance was the inferior surface of the left anterior lobe. The substance of the cerebellum was softer than natural. The pons Varolii was entirely covered with matter, and its substance soft. The fourth ventricle was full of matter; the walls of the aqueduct of Sylvius were destroyed by suppuration; the corpora striata of a bluish-grey colour. At the basis of the brain, there were about 2 drachms of bloody serum.

The sclerotica, choroid, lens, and vitreous body were healthy. Even the optic nerve showed no remarkable disease. Of the muscles of the eye, only the rectus superior was involved in the process of suppuration. The roof of the orbit, to the extent of an inch in diameter, was of a bluish-grey colour, and so friable that the least pressure broke through it, and indeed in the middle of this space the bone was already penetrated, so that the cerebral abscess communicated there with the abscess in the orbit. The floor of the orbit was also of a bluish-grey colour, and drilled through, so that the probe passed into the antrum and to the back part of the soft palate. The antrum was full of matter, which made its way through the body of the superior maxillary bone.[7]

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[1] Guthrie on the Operative Surgery of the Eye, p. 155; London, 1823.

[2] Lectures in the Lancet; Vol. ix. p. 500; London, 1826.

[3] Observations on the Treatment of the Epiphora, &c., p. 295; London, 1818.

[4] Bulletin de l'Académie Royale de Médecine de Belgique; Tome ix. No. 9.

[5] Dalrymple's Pathology of the Human Eye, Explanation of Plate xii; London, 1849.

[6] Burserius, Institutiones Medicinæ Practicæ; Vol. iii. p. 9; Lipsiæ, 1798.

[7] Fischer, Klinischer Unterricht in der Augenheilkunde, p. 9; Prag. 1832. See case of orbital abscess, with caries of malar bone and protrusion of eyeball, terminating fatally, by Walton, Medical Times, November 14, 1846, p. 127. Case of abscess in in orbit and brain, by Walton, Medical Times and Gazette, February 26, 1853, p. 217. Case of encysted abscess in orbit, communicating with frontal sinus, by Warren, American Journal of the Medical Sciences, July 1850, p. 34.

SECTION IV. — INFLAMMATION OF THE OCULAR CAPSULE.

For our knowledge of this disease, we are indebted to the observations of Dr. O'Ferrall.[1] He considers it, as, in general, a rheumatic affection. The subjects of it are certainly often rheumatic, and are sometimes suffering from pains in the limbs, when their eye becomes affected. The disease may have a traumatic origin.

Symptoms. The symptoms bear a general resemblance to those of the disease last described. The patient is seized with pain in the eye, forehead, and temple, which rapidly increases in violence, and in the course of two or three days becomes insupportable. It is liable to severe exacerbations, and is compared by the patient, to the feeling as if the eye was being dragged out of the socket. In this state he cannot bear the finger of another to touch the eye, although he seems to derive some relief from keeping the palm of his own hand pressed moderately against it. The pain may prevent sleep for several nights in succession.

The eyeball is protruded from the orbit, sometimes as much as three quarters of an inch, so that it is uncovered. The power of moving it is lost. The conjunctiva of the eyeball is protruded all round the cornea, in the form of chemosis, but is not red or vascular. It is of a pale amber hue, and is manifestly distended by serous infiltration. The eyelids become much swollen, they are œdematous, and of a dusky red colour, from the distended veins with which they are covered. The swelling and discolouration of the upper eyelid are limited above by a well-defined line, with about half an inch of pale skin between it and the margin of the orbit. This is a particular upon which Dr. O'Ferrall insists strongly, as marking the confinement of the disease within the ocular capsule, leaving the extra-capsular tissues unaffected. The eyelids cannot be closed, so that the protruded eyeball is uncovered. In the midst of the swollen conjunctiva lies the cornea, perfectly transparent, and showing the iris in a state of health.

The patient complains of frequent flashes of light in the eye, but vision is not, in general, impaired. In some cases, however, the pupil is much dilated, and vision is indistinct.

The eye may recover from the state now described, either completely or incompletely, without the formation or evacuation of purulent matter. When the recovery is incomplete, the eyeball in some cases remains motionless, adhesion having taken place between the sclerotica and the ocular capsule, while the thecæ of the muscles, and the orifices in the capsule through which they pass, have become consolidated in consequence of the inflammation. If purulent matter accumulates to a certain extent within the capsule, the fold which naturally exists between the eyeball and the eyelids is obliterated, the conjunctiva then appears rounded into the form of a tumour, and if not opened artificially the abscess may burst spontaneously.

The progress of this disease is attended by considerable fever, the pulse is full and hard, the tongue loaded, and the renal secretion scanty.

Diagnosis. From periostitis of the orbit this disease is to be distinguished by the fact, that here pressure may be made perpendicularly against the bones of the orbit, without exciting pain, which is the reverse of what is observed in periostitis. (See p. 30.) From phlegmonous inflammation of the orbital areolar tissue, this disease may be distinguished by the swelling which attends it, showing itself in the tarsal, not in the orbital, part of the eyelids. These two diseases may, however, be conjoined. Inflammation of the ocular capsule attends, also, some of the varieties of ophthalmitis.

Treatment. 1. Great relief is obtained from venesection, arteriotomy, or numerous leeches to the temple and round the eye.

2. Antimonials and purgatives are useful.

3. Calomel with opium, administered till constitutional effects are produced, generally overcomes the disease by the third or fourth day.

4. Iodide of potassium, in large doses, is highly recommended by Dr. O'Ferrall. He narrates a case in which ten grains every third hour of the first day, and fifteen grains every third hour of the second day, appeared to check the disease. Diminished doses during the next three days totally subdued it.

5. Should the disease proceed to suppuration, the ocular capsule

will remain to be opened through the conjunctiva, at the point where fluctuation is felt.[1]

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[1] Dublin Journal of Medical Science; Vol. xix. p. 343; Dublin, 1841.

SECTION V.—EXOPHTHALMOS, OR PROTRUSION OF THE EYE FROM THE ORBIT.

Fig. Walton, fig. 105.

EXOPHTHALMOS, or protrusion of the eye from the orbit, is a symptom rather than a disease; but as it is often the only symptom, arising from some unknown cause, it is not unfrequently spoken of as if it were an independent affection. If the eyeball inflames violently in the protruded state, the term *exophthalmia* is substituted for *exophthalmos.*

The following are some of the causes of exophthalmos:—1. Periostosis and exostosis of the orbit. 2. Fungus of the dura mater, making way into the orbit. 3. Diseases of the nasal sinuses, making way into the orbit. 4. Diseases of the lacrymal gland. 5. Inflammation of the orbital areolar tissue, or of the ocular capsule; and effusions into these structures. 6. Phlegmonous and phlebitic ophthalmitis. 7. Orbital tumours and aneurisms. 8. Fungus hæmatodes of the optic nerve, or within the optic sheath. As a probable cause, in certain cases, may be added, 9. A varicose state of the ophthalmic veins.

§ 1. *Simple Exophthalmos.*

Simple exophthalmos, with the movements of the eyeball unimpeded and vision good, and without any tangible tumour, growth, or fulness, is a case which occurs not unfrequently, continues perhaps for years in the same state, and upon which no distinct diagnosis can be given. There seems reason to believe that in such cases the cause of protrusion is without the ocular capsule, else the eyeball would be impeded in its movements, if not absolutely fixed, and the disease is not within the optic nerve, else vision would be abolished; but where the pressure exists which displaces the eye, whether above or below, on the nasal or temporal side of the orbit, or behind the eyeball, or out of the orbit, as in the cranium or in one of the nasal sinuses; and what it is, whether a varicose state of the ophthalmic veins, or an effusion or abscess in the cellulo-adipose tissue, an enlargement of the lacrymal gland, or an encysted or solid tumour, no one can tell. The symptoms are occasionally somewhat more complicated; pain is sometimes experienced; in other cases amaurosis; or both of these together. In all such cases, the treatment must, till a cure is accomplished, or till the cause becomes tangible by protruding between the eyeball and the edge of the orbit, be merely experimental.

Cases of this disease occur in males as well as females. The subjects of it are rarely robust. In general, one eye only is affected. As exciting causes may be mentioned fatigue, anxiety, and exposure to cold. I was consulted for a girl of eight years of age, with exophthalmos of the right eye, produced by chin-cough. The eye was moveable, and vision good. Her brother had been in the same state, but in him the eye retreated under cold applications. Another instance of exophthalmos which I saw, was first observed on the day following a violent hysteric fit. In this case, leeches and iodine seemed to produce little benefit.

It is plain, that in all cases of exophthalmos, the recti muscles must suffer a degree of elongation. That a want of their natural tonicity, by means of which the eye ought to be retained in its situation, is in some measure the cause of the displacement, as appears to have been supposed by Mr. Dalrymple[1], is not improbable.

There is a peculiar variety of exophthalmos, in which the eye protrudes only when brought into a depending position, receding as soon as the head is raised. A peculiar protrusion of the eye is mentioned as a result of palsy of the recti, and has been called *ophthalmoptosis.* Whether the eye recedes into the orbit in this affection, I am not aware. In the following case, the only one of the kind which I have seen, there appeared to be no paralytic affection.

Case 196. — The patient was a cooper by trade, and was admitted at the Glasgow Eye Infirmary, for catarrho-rheumatic ophthalmia affecting chiefly the right eye. After he had attended for a few days, it was discovered that if he stooped forwards, although only for a few minutes, he felt as if something was filling or pressing above his right eye, which immediately began to protrude. On raising his head, the protrusion was very striking. In this state he saw indistinctly with the eye. It soon began to retire, and in a few minutes was in its natural place. He had the complete power of moving the eye, when in its natural situation, and moved it considerably even while it was displaced. The iris moved naturally. He complained of considerable pain in the orbit, which was relieved by venesection, and the use of mercurial purges. He stated that the protrusion of the eye commenced about five years before his application at the Eye Infirmary, after carrying a heavy load upon his back. It was difficult to assign any satisfactory explanation of the case. The most likely conjecture seemed to be, that the protrusion depended on a varicose state of the ophthalmic veins, the blood flowing back through these vessels into the sinuses of the dura mater, when the head was elevated or thrown back, again to gravitate into them, in their relaxed state, when the head was bent forward. There must also have been a defective tonicity of the muscles.

In simple exophthalmos, if the patient is at all able to bear depletion, and especially if there is pain in or round the orbit, leeches should be applied abundantly to the temple and side of the nose; mercury should be administered till the mouth is affected, followed by iodide of potassium; and counter-irritation to the temple and behind the ear should be employed. By this plan of treatment, I have repeatedly seen the disease, when recent, completely removed.[2]

By several authors instances are recorded of exophthalmos, in which neither sanguineous effusion, inflammation of the orbital areolar tissue, nor any circumscribed orbital tumour, appears to have existed. In some of the cases, the exophthalmos yielded to the use of remedies, and although it is impossible to determine the exact nature of the cause to which the protrusion was owing, the facts are too valuable to be, on this account, passed over without notice. Saint-Yves entitles the chapter in which he narrates the three cases which I am about to quote, *Des Amas d'Humeurs qui se font derrière le Globe de l'Œil.* Mr. Ware[3] speaks of similar instances, as occasioned by a morbid accumulation of the substance on which the eye rests in the orbit, and tells us that the repeated application of leeches on the temple and forehead has been of great use in subduing the disease. In one case which came under his care, the projection was speedily diminished by opening the temporal artery, and after the bleeding ceased, converting the orifice into an issue. In another case, a perfect cure was accomplished by the application of a large caustic behind the ear.

Case 197.—In the first case related by Saint-Yves, he supposed the fatty cellular substance behind the globe of the eye, as well as the lacrymal gland, to have been tumefied by the effusion of a viscid liquid. The eyeball was protruded at least three lines. Several surgeons who were consulted wished to extirpate the lacrymal gland, in the hope that the suppuration of the wound would lead to the replacement of the eye, and dissipate the swelling within the orbit. Saint-Yves objected to this proposal, being afraid lest the disease, which appeared to him of a scrofulous nature, might degenerate into cancer. He cured it perfectly by a three months' course of æthiops mineral.

Case 198.—The subject of Saint-Yves' second case was a young man, who came to Paris, with the globe of the eye inflamed, and extremely protruded. The eyelids, pressed by the globe against the edge of the orbit, were swollen, and the upper was even beginning to be livid, as if ready to fall into a state of gangrene. The patient attributed his complaint to a *coup de soleil*, which had been followed first of all by pain deep in the orbit, and then by protrusion of the eyeball. Saint-Yves concluded from the symptoms, that either there was an abscess behind the eye, or that the fatty cellular membrane of the orbit was tumefied by infiltration. Had he been certain that it was an abscess, he would have pushed a lancet through the orbicularis palpebrarum to the bottom of the orbit, but afraid of doing so without reason, he resolved to try the effect of a sorbefacient treatment. He ordered, therefore, 8 grains of calomel at night, with a dose of senna, manna, and jalap next morning; and in the meantime bled the patient from the external jugular vein. Finding that the first dose produced some good effect, he continued the calomel and the purgative mixture; and in a few days had the satisfaction of finding the exophthalmos completely removed.

Case 199.—Saint-Yves relates a third case, in which the symptoms were for a time alleviated by the use of remedies; but at length the pain growing insupportable, and totally preventing sleep, the eye at the same time becoming disorganised, he removed the contents of the orbit. Unfortunately, he neglects to give any account of their appearance on dissection, although he speaks confidently of the cause of the protrusion, as *un amas d'humeurs visqueuses.*[4]

Case 200.—Louis quotes, from the *Medicina Septentrionalis* of Bonetus, the case of a girl, three years of age, whose right eye was almost entirely protruded from the orbit. Bonetus was asked whether a seton in the neck was likely to be useful. He observed that the child's clothes were much shorter before than behind, and this led him to examine the abdomen. He found it extremely tumid, tense, and hard. The child, in fact, presented the symptoms of tabes infantum. Bonetus thought that nothing could be done directly for the eye, but that the obstructed state of the bowels only should be attended to. After being purged, she was put on the use of tincture of rhubarb for a month. The exophthalmos gradually decreased as the abdomen fell; and by the time that the digestive organs were restored to health, the eyeball had, without any other means of cure, recovered completely its natural situation.[5]

Case 201.—A man, aged 40, experienced for four or five days a racking pain in the right orbit, temple, and side of the head. When he came to the hospital, these symptoms were getting worse, attended with high fever, but no derangement of the intellectual functions. Active antiphlogistic treatment was resorted to for four days, without alleviation; at the end of which time, and in the course of one night, the eyelids became enormously tumid and red, which state extended for a certain distance to the temple and cheek; the eye was extremely protruded downwards and outwards, but vision not impaired.

It was thought the symptoms might be owing to an abscess in the orbit. An incision was accordingly made through the upper eyelid, but though first a scalpel, and then a bistoury, were plunged very deep, no matter issued. A poultice was ordered, and next day, no pus having appeared, a bistoury, says Mr. Hamilton, was swept nearly right round the eye, and so deep as almost to endanger the optic nerve. This was not more successful than the former operation; every symptom became aggravated, and on the fourth day the patient became stupid, and soon expired. His intellect and vision continued unimpaired till within the last few hours.

A post-mortem examination showed the swelling of the orbit to depend on the effusion of serum, no matter being discovered; but a circumscribed abscess existed in the right anterior lobe of the brain, the rest of the brain being healthy.[6]

§ 2. *Anæmic Exophthalmos.*

In this variety, both eyes are almost always affected. They look as if they were enlarged, but are not so in reality. Women are more frequently the subjects of this disease than men.

Symptoms. 1. The eyeballs are so much protruded, that the eyelids stand wide open, and allow a considerable portion of the sclerotica above the cornea to be seen. This gives the patient a staring, wild expression. The eyeballs feel often abnormally firm to the touch of the observer. There is no visible disease in their interior. Their motions are in general tolerably free, although the patient occasionally complains of a feeling of stiffness, distension and fulness in the eyes, and of a difficulty in turning them completely to one or other side. The eyes are not painful, not even on being pressed. In general, any redness which they present, consists only in a few dilated vessels strewed over their surface. The conjunctiva is frequently œdematous, especially towards the periphery of the eyeball. The eyelids are puffy, and the lower one is sometimes dark and discoloured. The protrusion of the eyes is sometimes so great, that the patient cannot close them completely, or even at all, without first pressing them back with the palm of the hand. Vision is not materially affected, although some patients complain of their sight failing them.

2. Anæmic exophthalmos is generally attended by enlargement of the thyroid gland, and these two symptoms are apt to make their appearance together. The swelling of the gland is generally soft and uniform, being of the nature of simple hypertrophy, but sometimes it is the seat of various adventitious structures. The exophthalmos may exist without the bronchocele, and *vice versâ.*

3. The patient presents more or less of the pale, bloodless complexion, characteristic of anæmia.

4. The heart is affected with palpitation, the pulse is quick, feeble, and jerking, and the patient complains of dyspnœa, faintness, pain and throbbing in the head, vertigo, and tinnitus aurium. All these symptoms are increased on exertion. The veins of the neck are sometimes remarkably distended. The heart and large arteries give a bellows-murmur, especially when the patient is under palpitation from excitement. In some cases, the heart is dilated; but, in general, the cardiac symptoms are those indicative merely of exsanguinity.

5. The patient complains of dyspepsia, debility, and nervousness.

Exciting causes. 1. Frequent or continued loss of blood, as from hæmorrhoids, menorrhagia, or epistaxis. 2. Profuse leucorrhœa, chronic diarrhœa, and other wasting discharges. 3 Frequent child-bearing. 4. Over-excitement, fatigue, apprehension, and distress of mind.

Dissection. The only *post mortem* examination is one by Sir Henry Marsh, in which the heart, especially the auricles, was found extremely dilated, along with the veins of the neck. The right internal jugular vein was so much dilated, that, when emptied by puncture, it measured an inch and a half across.[7] It can scarcely admit of doubt, that, when anæmic exophthalmos exists, there is an approach to the state so accurately described by Dr. J. S. Combe[8], in a case of anæmia, in which the eyes were not affected. A deficiency of red blood, then, may be expected on dissection.

Proximate cause. Impoverishment of the blood, so that it is deficient in fibrine and in red corpuscles, as well as less in quantity than natural, may be regarded as the general proximate cause. The want of a healthy and sufficient circulation through the brain explains many of the symptoms. The immediate cause of the protrusion of the eye is unknown. A varicose state of the ophthalmic veins may possibly be the cause. This conjecture is favoured by the state of the veins of the neck in the case dissected by Sir H. Marsh, and by the fact mentioned by Mr. Walton, of a patient who could close her eyes, only after she had pressed upon them for some minutes with the palm of her hand. A serous effusion into the areolar tissue of the orbit, which is another conjectural cause of anæmic exophthalmos, could scarcely yield to such a degree of pressure, but a varicose dilatation of the veins behind the eyeball might readily do so. The motion of the eyeballs being in general so little affected, it does not appear likely, that the cause is an effusion into the ocular capsule. Such an effusion, however, would explain the apparent enlargement of the eyes.

Anæmic exophthalmos commonly assumes a chronic form, but in some cases it occurs so suddenly, and runs so rapid a course, that it may be regarded as an acute disease.

Case 202. — On the 6th April, 1850, I was called to visit in consultation a lad of 16, under the care of Dr. James Miller. He had come from London to Glasgow by railway about a fortnight before, and had probably been exposed to cold in the journey, immediately after which he was seized with exophthalmos of both eyes, the conjunctivæ at the same time becoming œdematous and protruding in folds. Under the apprehension of the case being one of phlegmonous ophthalmitis, Dr. M. had bled him copiously, applied leeches to the temples, administered antimony, salivated the patient gently, applied a blister to the back of the neck, and snipped away some folds of the conjunctivæ, so as to give exit to the serous effusion.

When I visited the patient, he was confined to bed; the eyeballs were much protruded; the pupils large, but it seemed probable that they were naturally so; the eyeballs could easily be shoved to one or other side of the orbit, and were not fixed as in phlegmonous ophthalmitis; the vision was good. The pulse was 82, full, and jerking. On laying my hand over the heart, I found it affected with palpitation. On opening the shirt, the thyroid gland was seen to be enlarged, and was painful to the touch. The neck was much swollen, all round to the nape. The swelling seemed of the nature of œdema. The patient was by times slightly delirious.

This young lad had never till now complained of palpitation. He had been observed to be pale for some time. He had been much given to violent racing, and games of strength.

I advised rest, without any further depletion or mercury. I did not see the patient again. He died in a few days. No inspection was obtained.

That there sometimes exists a hereditary predisposition to the state of the blood which leads to anæmic exophthalmos, may be concluded from the disease occurring in several individuals of the same family.

Case 203. — A lady, whom I saw with Dr. Pagan, had exophthalmos of the right eye, accompanying enlargement of the thyroid gland and of the uterus. So far as the last-mentioned affection and the general health were concerned, much benefit had been derived from chalybeates, cod-liver oil, and friction with iodine.

This lady's sister I had seen some years before, with anæmic exophthalmos of both eyes. Naturally of a nervous and languid temperament, her health had not been robust for many years, but it seemed to have been more impaired during the two years before I saw her, and since her last confinement. She had suffered for some months from amenorrhœa, and had been considerably annoyed by dyspepsia and constipation. During the summer before she consulted me, she had exposed herself to much fatigue, while in the country, soon after which she observed that her sight began to fail, and her eyes became prominent. She also had an evident bronchocele. These symptoms had subsided, to a certain extent, after a slight alterative course, followed by stomachic and purgative medicines, and the internal use of tincture of iodine, while the throat and temples were rubbed with an ointment containing iodide of potassium. Headaches, however, and a tremulous sensation all over the body, supervening, the iodine was stopped.

Treatment. What is indicated is evidently such treatment as is likely to restore due assimilation and sanguification. For this purpose, the patient should adopt a nourishing diet, making use of animal food, with ale or porter, but generally without wine. All agitation and fatigue should be avoided. Passive, or gently active, exercise out of doors, and change of air, are to be recommended. The bowels should be kept in a regular state by proper laxatives. Extract of hyoscyamus has been found useful in calming the nervous agitation. The eyes should be bathed frequently with cold water. Stomachics, such as columba and cascarilla, or the common combination of either of these with bicarbonate of soda, rhubarb, and ginger, are of much service. The principal medicinal means of cure, however, is the employment of chalybeates, such as the precipitated carbonate, the sulphate, the muriate, the citrate, and other salts of iron. These are to be given in large doses, along with or after meals, and continued uninterruptedly for months.

Under this plan of cure, the eyes have been found to retreat into the orbits, the lids to close with freedom, the thyroid gland to return to its natural size, the palpitations to cease, the strength to be restored, and in fact a perfect cure to be attained.[9]

The disease resists the internal uses of iodine and its preparations. They even seem to be hurtful, disagreeing with the stomach, and causing such unpleasant sensations throughout the frame, as oblige them to be discontinued. Mercurials are still more to be deprecated than the preparations of iodine.[10]

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[1] Lancet, May 26, 1849; p. 553.

[2] See cases by Pilcher, Lancet, June 10, 1848; p. 640: Case by Browne, Dublin Quarterly Journal of Medical Science; Vol. xi. p. 232; Dublin, 1851.

[3] Observations on the Treatment of the Epiphora, &c., p. 295; London, 1818.

[4] Nouveau Traité des Maladies des Yeux, p. 141; Paris, 1722.

[5] Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 350; 12mo; Paris, 1774.

[6] Dublin Journal of Medical Science; Vol. ix. p. 262; Dublin, 1836.

[7] Dublin Journal of Medical Science; Vol. xx. p. 472; Dublin, 1842.

[8] Transactions of the Medico-Chirurgical Society of Edinburgh; Vol. i. p. 194; Edinburgh, 1824.

[9] The use of a chalybeate water for cooking and drinking prevents the development of goître. See Pascal, London and Edinburgh Monthly Journal of Medical Science, December, 1842.

[10] On Anæmic Exophthalmos consult Macdonnell, Dublin Journal of Medical Science; Vol. xxvii. p. 200; Dublin, 1845: Hill, ibid. p. 399: Begbie, Monthly Journal of Medical Science, February, 1849; p. 495: White Cooper, Lancet, May 26, 1849; p. 551: Syme, Monthly Journal of Medical Science, Vol. x. p. 488; Edinburgh, 1850.

SECTION VI. — PROTRUSION OF THE ORBITAL ADIPOSE SUBSTANCE.

We owe our knowledge of this affection to Mr. Bowman, who relates the following case: —

Case 204. — A boy, aged 16, applied at the Ophthalmic Hospital, Moorfields, on account of a red and somewhat pendulous swelling of both upper eyelids, which made his friends and himself uneasy by its unsightly appearance, though he had experienced no pain. The swelling was precisely alike on the two sides. It was almost limited to the outer half, or outer two-thirds of the lid, extending from the brow to within a sixteenth of an inch of the tarsal border. It was quite soft, as if from œdema of the parts subjacent to the skin. The feeling was that of redundant and loose cellular tissue beneath the orbicularis, and not of any tumour. Eversion of the lid showed the conjunctiva and subjacent tissue to be perfectly natural. Pressure behind the external angular process detected no tumour.

Various remedies having been tried without effect, Mr. Bowman determined to employ a modification of the operation for entropium, and to remove, not merely a horizontal ellipse of integument from the most projecting part of the swelling, but also a corresponding portion of the orbicularis, and of the fascia below it, and so endeavour to consolidate the integuments with the parts beneath, which seemed the principal seat of the disease.

A piece of the integument was taken up with the entropium forceps, and removed with scissors to the extent of two-thirds of the horizontal width of the lid, and one-third its vertical depth. The orbicularis thus exposed was healthy, and was removed to exactly the same extent. A dense cellular fascia then bulged forward in the gap, which being removed in its turn, a mass of fat, resembling the natural fat of the orbit, and about as large as an almond, fell forward in the opening, and was immediately removed. It was not tightly embraced by any capsule of the areolar tissue which surrounded it, but was divided into pellets, or small lobes, which moved freely over one another. It therefore had not the appearance of a fatty tumour. After its abstraction, there was no other tissue projecting; the wound was therefore closed by sutures; and in four days Mr. B. had the satisfaction of seeing it heal, with an almost complete removal of the deformity.

The same operation was performed first on the left, and then on the right side, and with the same result.[1]

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[1] London Journal of Medicine, November, 1849; p. 989.

CHAPTER VIII.

INTRAORBITAL TUMOURS.

SECTION I. — SOLID AND ENCYSTED TUMOURS IN THE ORBIT.

TUMOURS in the orbit are malignant or non-malignant, and the latter solid or encysted. On the determination of the question, to which of these two classes, and to which of these two sub-classes, a tumour belongs, hinges greatly the prognosis and the treatment.

Malignant tumours grow more rapidly, are attended with more pain, are soft in some parts and firm in others, and are more likely to involve the skin and the neighbouring textures, than the non-malignant. When it is difficult to form a diagnosis, in cases where, besides displacement of the eyeball, there is a tumour evident to the touch, it is recommended to make an exploratory puncture, or even to divide the integuments covering the tumour, and endeavour to ascertain its nature. A careful inquiry into the progress of the case, with the exercise of the necessary degree of tact in examining, ought, in general, to preclude recourse to a practice so apt to prove hurtful. It cannot be denied, however, that in many non-malignant orbital tumours, the cachectic condition of the patient, and the appearance of the local disease being very indicative of malignancy, were exploration omitted, the patient might be left unrelieved, from a mistaken notion of the incurability of the case.

Symptoms. Whatever be the nature of a morbid growth within the orbit, it necessarily produces, after it reaches a certain size, displacement, protrusion, and immobility of the eye, pressure on the eyeball and its nerves, so as to cause pain, and traction of the nerve, which, added to the pressure, gives rise to amaurosis. This last is often the earliest symptom which attracts attention. A great degree of deformity is produced by the unnatural position of the eyeball in such cases, even when it is not at all affected in structure. There is intolerance of light, the tears run over the cheek, the pain extends from the orbit to the temple and rest of the head, and at length the eye inflames, bursts, and is disorganised.

The solid non-malignant tumours of the orbit, formerly styled *sarcomatous*, but now more frequently known as *fibrous*, are more or less of a firm consistence, and often very hard. They are less frequent, and grow more slowly than the encysted tumours, but seldom reach so great a size. They are circumscribed, lobulated, moveable, and free from tenderness. The bounds of the tumour can be distinctly made out, and the skin can be moved over it, which circumstances assist in distinguishing it from any malignant growth. On extirpation, it is found of a yellowish-white colour, surrounded by a covering of condensed areolar tissue, with a few bloodvessels entering it. Its structure, microscopically examined, appears identical with natural fibrous tissue, sometimes mixed with spiculæ of bone. The contents of the encysted tumours are very various; sometimes limpid (*hygroma*) like white of egg, in other cases a thick bloody fluid (*hæmatocyst*), in others a substance like suet (*steatoma*), pap (*atheroma*), or honey (*meliceris*).[1] Under the microscope, these contents show chiefly epithelial cells, with oil globules, and crystals of stearine. Sometimes the cyst is thin and serous, in other cases thick and fibrous. Occasionally hairs, and sometimes teeth, are found growing from the internal surface of the cyst.

No part of the orbit is exempt from becoming the seat of tumours. They grow near the front of the cavity, so as from the first to advance before the eyeball. Sometimes they are within the ocular capsule. Their most frequent situation is below and somewhat behind the eye. They grow above and behind it. Less frequently are they found by the nasal or temporal side of the orbit. In some cases, they lie deep in the orbit, or even surround the optic nerve.

Their connexions are very different; sometimes loose, so that on exposing the tumour, it is easily separated and extracted, while in other cases it adheres firmly to the muscles and nerves, insinuates itself between these parts, involves the lacrymal gland, or adheres firmly to the eyeball, the optic nerve, or the walls of the orbit.

They have all a tendency to advance out of the cavity of the orbit, pushing on between its walls and the eyeball, pressing the eyeball forwards and to one side, projecting the eyelids or everting them, and elevating the conjunctiva. When considerably advanced, we are able to detect a degree of fluctuation in many of the encysted tumours, while the fibrous feel sometimes spongy, often solid and resisting. The encysted are often so soft, that on pressure they seem to retire within the orbit, appearing again as soon as the pressure is removed. They are always more elastic to the touch than the fibrous tumours.

Encysted tumours in the orbit are sometimes combined with, or degenerate into, malignant disease. A remarkable instance of this I met with in a patient at the Glasgow Eye Infirmary, 22nd September, 1852. He came from a distance, with an encysted tumour, which had repeatedly been tapped by his surgeon at home, and into the cavity of which a tent had been at one time introduced. I proceeded to extirpate it as a common encysted tumour, but on extracting the firm fibrous cyst from the bottom of the orbit, I found it filled with encephaloid deposit.

In some cases, a great degree of œdema of the eyelids comes on, and obscures an orbital tumour previously distinctly felt, and even the opposite lids sometimes swell to a large size, as well as those covering the orbit which contains the tumour. Under such circumstances, we are obliged to judge a good deal from the previous history of the case, and the displacement of the eyeball.

It is a fact worthy of remark, that the pressure of a tumour within the orbit will sometimes dilate that cavity, or induce inflammation and caries of its walls, the eyeball continuing to resist the effects of the pressure. In this case matter is apt to collect, which, bursting through one of the eyelids, allows the probe to be passed into contact with the diseased bone, by the side of the tumour. A tumour in the orbit, if altogether left to itself, may extend to a very great size, and at length prove the occasion of the patient's death by pressure on the brain.

In cases of non-malignant tumours in the orbit, there is generally no constitutional disturbance. In cases of abscess, such disturbance attends the commencement of the disease, but subsides after matter is formed. In malignant cases, there is pain from the first, which continues as the disease advances, and is attended by signs of cancerous cachexia.

Causes. Blows on the edge of the orbit, and exposure to cold, are the causes most frequently referred to, in cases of orbital tumours on record.

Encysted tumours of the orbit have been described as hydatids by Schmidt, Weldon, Delpech, and others. Cysts containing hydatids do occur occasionally in the orbit, as I shall have occasion to state in the chapter on *Entozoa in the Organ of Vision;* but there is no good ground for believing that the tumours referred to by those authors, were of that nature.

Treatment. Leeches round the orbit, counter-irritation, and sorbefacient remedies, as iodine, both internally and externally, appear to be of little or no service in cases of orbital tumours. We are obliged, therefore, to have recourse either to the palliative cure of puncturing encysted tumours, or to partial or total extirpation. The last mentioned is the only means which we can adopt when the tumour is solid. When an encysted tumour contains a fluid, puncturing the cyst always affords temporary relief, and in some instances has been followed by a radical cure. To procure this result, injecting them has also been tried.

1. *Puncture of encysted tumours.* Encysted tumours in different parts of the body, and especially in superficial situations, are apt to burst in consequence of blows, or at length give way simply from distension, and discharge their contents. The cyst remains for a time, and operates like a foreign substance; inflammation comes on, ending in suppuration, and the cyst, especially if it be of the thin serous kind, is evacuated, either entire, or broken down into shreds; after which the cavity, formerly occupied by the tumour, contracts and heals up. Upon this course, sometimes followed by nature, is founded the practice of puncturing encysted tumours, and evacuating their contents. It is not a practice to be much commended. It is tedious and uncertain; for the cyst may not come away for weeks or months, and if any portion of it is left behind, or, as is often the case, if the whole of it is left, a new collection of fluid is apt to take place. It may also happen in the orbit, as it has often happened in other parts of the body, that this practice of puncturing encysted tumours produces great pain and irritation, and gives rise to a fungous growth from the inside of the cyst, especially if its walls are thick and fibrous. The difficulty, however, on the one hand, of completely extirpating encysted tumours of the orbit, and on the other, the total subsidence of the swelling, and the return of the eye to its natural situation, after the contents of the cyst are evacuated, have occasionally led surgeons to content themselves with this palliative plan of treatment. In numerous instances, the cure has luckily proved radical, by a discharge of the cyst. This is most apt to follow when the contents are like suet or pap, not when the tumour is hygromatous or hæmato-cystic.

On puncturing encysted tumours in the orbit, an oily matter is not unfrequently discharged, very like pus; and hence tumours of this sort may sometimes have been mistaken for abscesses.

The following is an instance of the accidental bursting of an orbital encysted tumour:—

Case 205.—A lively girl, about 17 years of age, had a small opening at the temporal edge of the left orbit, close to the tarsus of the upper eyelid. Every morning she found the neighbourhood of this opening somewhat swollen, and by pressure evacuated through it a quantity of a whitish, pretty consistent, ropy substance, something like half-fluid tallow. The origin of her complaint was her suddenly leaping against a door, believing it to be open, when it was shut, and which she struck violently with the left side of her head. The part immediately became swollen and livid. Fomentations and poultices were employed, and the immediate consequences of the contusion were removed. After some time, a small swelling made its appearance under the skin of the part which had been struck. This swelling increased, notwithstanding the use of embrocations and the like, and much disfigured the girl's countenance. It had acquired the size of a walnut, and a day was fixed for its extirpation, when she happened by accident again to strike her head against the same door so violently, that the cuticle was stript from off the part, and the tumour so much bruised that it suppurated. The abscess was opened, the cyst gave way, and a yellowish-white substance, like honey, was discharged, after which the wound contracted to the small opening, which existed when Dr. Schwarz, the narrator of the case, saw the patient. He did not think it necessary to urge her to have the cyst removed by operation, as the inconvenience of emptying it from time to time was but trifling.[2]

In the two following cases, the puncturing of encysted tumours in the orbit, proved a radical cure.

Case 206. — *Cure by puncture and suppuration.* A shoemaker, aged 45 years, had the left eye prominent, and almost entirely out of its orbit. This exophthalmos had come on gradually, attended with pain, but without inflammation. The eye was pushed out by a hard tumour, which appeared to be situated between the globe and the inner wall of the orbit. Several practitioners in Paris were of opinion that the tumour was cancerous. The protruded eye was not enlarged, but was deprived of sight from compression and traction of the optic nerve. Richerand proposed to the patient to extirpate this suspected carcinoma, although from the renitency of the tumour he had his doubts concerning its nature. After having disunited the eyelids at their outer angle, and divided the conjunctiva, he thought proper, before going on with the operation, to assure himself of the real nature of the disease by plunging into it the point of his knife. This was followed by the exit of 2 or 3 ounces of a fluid similar to white of egg. Being now certain that the exophthalmos depended on an encysted tumour, and the eye having already, in consequence of the contraction of the cyst, retired partly into its natural place, Richerand renounced the idea of extirpation, and contented himself with applying wet compresses over the eye. Considerable inflammation followed, for which he bled the patient. The cyst suppurated, and the patient was cured after the excision of some excrescences formed by the conjunctiva.[3]

Case 207. — *Cyst discharged, after being punctured.* A woman was brought to Mr. Weldon, with one of her eyes considerably protruded. About two years before, she felt a fulness of the eye, and a stiffness of the eyelids, so that they moved with difficulty. As these symptoms increased, she became sensible of a feeling of pressure and uneasiness in the ball of the eye, which gradually became painful, especially on moving it. At length the eye became fixed, and the pain increased to such a degree that the patient was at times delirious. When Mr. W. saw her, the eye was protruded forwards, and rather upwards, towards the inner angle. The eyelids were open and immovable, and there was a general fulness of the surrounding integuments. The sight had been lost about 12 months, and the iris was motionless. The blood-vessels of the eye were full and turgid. The pain she described as being intolerable, and almost without remission, extending at times over the whole head, but, in general, pretty much confined to the globe of the eye, and the situation of the optic nerve. It was attended by a sense of pressure and great distention. On feeling the integuments that covered the orbit beneath the eye, the sensation to the finger resembled that produced by feeling a loose fatty substance, but on examining the part more attentively, a deep-seated fluctuation was very evident. The parts were free from any tenderness or pain on pressure. With a cataract-knife Mr. W. made a puncture into the tumour, from the middle of the lower edge of the orbit, and pressed out a small quantity of transparent fluid. He then extended the wound for nearly an inch towards the outer canthus, taking care to keep the point of the knife sufficiently deep, and to carry it forwards at the same time, so as to open the cyst very freely. About two table-spoonfuls of a clear transparent fluid, slightly adhesive, came away. This was followed by instantaneous ease, while the eye sunk nearly into its natural place. The lips of the wound were kept asunder, and in five or six days the cyst, which Mr. W. fancies to have been a hydatid, appeared in view, and was withdrawn. This coat, as Mr. W. terms it, was spherical, rather thicker than the coats of hydatids of a corresponding size usually are, and had a smooth shining surface. The discharge gradually lessened, and the wound healed without further trouble in the course of three weeks. The pain and affection of the head totally ceased, and the eye, to a common observer, appeared as the other. The iris remained motionless, and the sight totally lost.[4]

Case 208.—*Death after the operation of puncturing a cyst, which was prolonged through the foramen opticum into the cavity of the cranium.* Louis Bonnet, aged 20, from the time he was eight years of age had a considerable tumour which filled the left orbit, and formed so large a projection between the eyelids that they were kept separate from each other to the extent of an inch and a half. The intermediate space was covered by inflamed conjunctiva, scarcely any trace remained of the cornea, and the eye was atrophic. The tumour which distended the lids, and seemed to fill the orbit, was so placed between the muscles of the eye, that it was moved by their contractions as the eye naturally is. The renitency of the tumour showed it to be encysted.

The patient could say nothing of the cause of his disease. He recollected that in the commencement he had pretty smart pain, for a month, in the bottom of the orbit, followed by gradual protrusion of the eyeball, that the vision became weaker and weaker as the eye protruded, and that the cornea ulcerated and burst, allowing the humours to escape.

It was easy to see that the cavity of the orbit had undergone an extraordinary degree of dilatation, so much so as to change the form of the forehead, nose, and upper jaw. The opposite orbit seemed natural, the sight of the right eye perfect, the other senses and the intellect entire. The patient had no headache, and perceived no difference in the power of the two sides of his body. He suffered most from frequent conjunctival inflammation, and was earnestly desirous of a cure.

Delpech plunged a straight bistoury through the middle of the lower lid, the point where the tumour felt most renitent and fluctuating. A transparent, yellowish fluid was immediately ejected with great force. The quantity, also, was much more than Delpech had expected, even taking into account the enlarged size of the orbit. On passing his finger into the cavity of the tumour he found, as he had anticipated, that the cyst was of the sero-mucous kind, and that it presented numerous irregular indurations; but what was his astonishment when he discovered that the cavity was prolonged into that of the cranium, through the foramen opticum, which was dilated to such a size as readily to admit his forefinger! Caddis was gently passed into the cavity of the cyst, and the edges of the wound kept separate by a fold of linen covered with cerate.

The patient suffered but little during the first two days; but on the 3rd day, the symptoms announced inflammation of the brain and its membranes. Pain extended from the wound to the forehead and occiput; the features of the patient changed; and notwithstanding venesection, emollient fomentations of the head, and other remedies, he was very restless during the night, and somewhat delirious. Next day his pulse was more frequent, with burning heat of skin. Twenty leeches were applied to each temple. On the 5th day he was insensible, and died in the evening.

The vessels of the brain were highly injected; the sub-arachnoid cellular tissue infiltrated and semi-opaque. In the lateral ventricles there were about 3 ounces of milky serosity. All the lower surface of the brain, especially towards its left and anterior part, was soft and of a slate colour.

Opposite the internal temporal fossa of this side, and close to the sella Turcica, there was such an adhesion of the cerebral substance, that it was necessary to cut it in thin layers to separate it, and to discover the state of the parts. It was then perceived that the softening of the brain in almost its whole left anterior lobe had advanced to the state of purulency. A prolongation of the orbital cyst was found imbedded in the inferior surface of the same lobe, to the depth of nearly 3 inches, having pushed aside to that extent the pia mater and tunica arachnoidea. It was firmly adhering to these membranes. This prolongation presented, like the rest of the cyst, bosses and considerable inequalities of thickness in its parietes. Its structure was completely the same, its cavity contained the same purulent matter, and in fact it was separated from the orbital portion merely by a sort of isthmus formed by the foramen opticum. This foramen presented a diameter of about two-thirds of an inch, a change which it had evidently undergone while yet in a soft state. The left optic nerve had entirely disappeared in consequence of the pressure of the cyst.

On the inferior surface and in the substance of the right anterior lobe of the cerebrum was another sero-mucous cyst, similar to that on the left side, except that its cavity contained only pure serosity, and that it lay in the substance of the brain without pressing aside the pia mater and tunica arachnoidea. Its size was equal to half a pigeon's egg divided longitudinally. Round this cyst the brain was softened and of a slate colour, and the corresponding point of the meninges had suffered slightly from inflammation.[5]

2. *Partial extirpation of encysted tumours.* On account of the difficulty of removing the cyst in an entire state, and the danger of injuring important parts when the disease reaches deep into the orbit, recourse is sometimes had to partial extirpation of encysted tumours in this situation. The front of the tumour being exposed in the usual way, the cyst is laid hold of with a double volsella, and as much of it excised as can conveniently be brought within the grasp of the scissors. The portion of the cyst which is left inflames, the external wound heals up more or less promptly, and in some cases there is no farther trouble experienced; but more frequently the wound opens repeatedly, till the cyst, destroyed by suppuration, is discharged.

Case 209.—*Anterior half of cyst removed, and posterior half touched with caustic.* Donald Mackinnes, aged 18 years, was admitted into the Glasgow Eye Infirmary, under the care of Dr. Monteath, on the 28th of September, 1827, on account of a soft tumour which, since infancy, had been observed to project from the right orbit, immediately above the tendon of the orbicularis palpebrarum. Its projecting part was as large as a middle-sized gooseberry, and as far as could be judged, the tumour dipped deep into the orbit. The eyeball was not displaced, nor did the patient experience any pain, but he was anxious to have the tumour removed on account of the deformity, which was very considerable. The integuments were divided and dissected back, and when the anterior half of the tumour was thus exposed, it was laid hold of and excised. The cavity of the posterior half could now be distinctly seen, dipping nearly an inch into the orbit, close to its nasal wall. It was evident that this part of the cyst could not be removed, even by a laborious dissection. The whole cavity was therefore rubbed over with nitrate of silver, and then stuffed gently with lint, over which a compress and bandage were applied. Very little inflammation succeeded the operation. The cavity contracted from day to day, and was very soon completely obliterated, leaving no deformity.

The following case will illustrate some of the dangers attendant even on the simple operation of partial extirpation :—

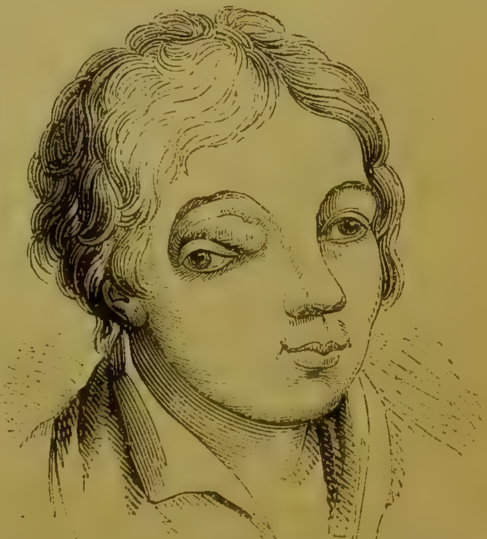

Fig. 40.

Case 210.—*Violent inflammation after removal of anterior half of cyst.* Agnes Crawford, aged 14 years, was admitted a patient at the Glasgow Eye Infirmary, under the care of Dr. Monteath, on the 24th October, 1827. For six years, a tumour had been observed to project from the right orbit, pushing the upper eyelid before it, and most protuberant about midway between the tarsal border of the eyelid and the bony edge of the orbit. The greatest projection of the tumour was at the upper and inner part of the orbit, so that the eye was forced downwards and outwards. (*Fig.* 40.) The part of the tumour which appeared externally was as large as a green gage plum, and from the very great displacement of the eyeball, it was concluded that the portion lying within the orbit was also large and extended deep. The skin covering the tumour had a dirty livid colour. On partially everting the eyelids, the inferior part of the tumour was seen bulging through the conjunctiva. The girl suffered no pain. The vision of the eye was perfect, and the tunics free from inflammation. Though the eye was turned very much to the right side, she had no diplopia. She enjoyed good health. She had never menstruated. The tumour had been repeatedly punctured, and at one time a thread had been drawn through it and worn for some time, without producing either good or bad effects.

On the 28th of October, after low diet for three or four days, and two doses of laxative medicine, the patient was laid on a table, and an incision, nearly two inches long, made in the direction of the fibres of the orbicularis palpebrarum. The integuments were dissected back with a scalpel and a blunt silver knife, till more than the anterior half of the tumour was exposed. This was now cut away with the scissors. An immense discharge of fluid immediately took place from the sac, of the appearance of dark blood. This was followed by very considerable hæmorrhage from the bottom of the orbit. Dr. M. thrust his finger to the bottom of the orbit, and by pressure soon stopped the violence of the bleeding. Cold water was next injected for about a minute, by means of a syringe, deep into the orbit, which caused the bleeding to cease. Examination with the finger clearly demonstrated that the tumour had extended to the very bottom of the orbit, and even occupied there much space. It was therefore impossible to dissect out the posterior part of the cyst, so that it was merely stuffed moderately with a strip of lint. Another strip was placed between the lips of the external wound, to prevent adhesion. A compress was laid over all, and the eyes shaded. Before the patient had left the operation table, the eyeball had retreated very considerably into its natural position.

Next day the whole of the upper eyelid was red and much swollen. The patient complained of headache, and her pulse was 112. Ten leeches were ordered round the orbit; after which an emollient poultice was applied, and she had a dose of castor oil. On the third day the report states that the leeches had bled freely; but that the tumefaction having, upon the whole, increased, as well as the headache and fever, the tent was withdrawn. She had suffered much during the night, the pain being pulsating and constant, both in the eye and head. In the morning she had been seized with vomiting. The pulse was still above 100. The tumefaction was now so much increased that the exophthalmos was greater than before the operation. The eyeball being chemosed, a portion of the swollen conjunctiva was snipped off. A probe was passed through the wound to the bottom of the orbit, but no retained blood nor pus was discharged. A small portion of sloughy matter, apparently part of the cyst, was extracted from the wound, at the mouth of which it presented. Twelve ounces of blood were taken from the arm at noon, and six more at 7 P. M. On both occasions she became faintish. The blood was buffy. The pulse fell a little, became softer, and she felt relieved. The poultice was continued, and she was ordered a dose of Epsom salts in divided quantities, which operated freely in the night, and disturbed her sleep. She had much less pain than during the previous night. Next day, the fourth after the operation, the pulse was about 90 and soft, the tumefaction of the eyelids, of a deep red colour, and very sensible to the touch, was increased to the bulk of the half of a middle-sized apple, the greater part of the swelling being formed of the upper eyelid; the chemosed conjunctiva projected from between the aperture of the lids; the cornea continued transparent, and vision was, as yet, good. Her thirst had been immoderate for the last three days, and still continued. She had frequent transient chills through the course of the day. Upon the whole, the pain of the eye and head was less than on the preceding day. She was ordered a draught, with 25 drops of laudanum, and the poultice was continued.

For two days the tumefaction of the lids increased, particularly of the lower, which became so broad as to reach as low as the opening of the nostril. The swelling was indeed enormous, and the whole of it very tender to the touch. The cornea could with difficulty be seen, being overlapped by the chemosed conjunctiva. So far as it could be seen it was transparent, but the pupil appeared enlarged, and she said she could not see.

From the fourth till the eighth day the pulse varied from 75 to 90; the thirst gradually ceased; there was some return of appetite; and the headache and pain of the eye declined, so that by the eighth day they were nearly gone. The bowels were gently purged with Epsom salts, and she had an anodyne each night with much benefit. On the seventh and eighth days the wound discharged matter pretty freely. Both eyelids had by this time become softer, and much less swollen. On the eighth day it was observed that pus had made its way from the bottom of the orbit, through two apertures in the conjunctiva, where it is reflected from the lower eyelid to the eyeball, near the nasal canthus. For some days previously to this the poultice had been discontinued, and the eyelids covered with lint smeared with simple ointment. The draught was now omitted. On the 28th of January, 1828, the report states that the incision had been completely closed for some time, and that the eye had retired more into its proper situation. The pupil, however, continued dilated, and there was no return of vision. The patient was free from pain, and her general health was improving.

On the 8th of February, the eye was still more in its natural place, and its power of motion increased, but no renewal of vision. The patient now left the Infirmary for her home in the country, and in a few months died of phthisis pulmonalis.

3. *Total extirpation of encysted tumours.* The complete extirpation of an orbital encysted tumour is an operation almost always attended with considerable difficulty. The flow of blood, the danger of rupturing the cyst, the instant escape of its contents if it be accidentally torn or wounded, the embarrassment attending the removal of it in the collapsed state, and the great depth to which the cyst often extends within the orbit, are the circumstances which have led to the practices of puncture and partial extirpation. The total removal, however, of the cyst, is more satisfactory.

The operation of extirpating a tumour, situated exterior to the ocular capsule, is generally performed by making a transverse incision through the skin of one or other eyelid, parallel to the fibres of the orbicularis palpebrarum. This incision is not to be made freely, but cautiously, avoiding the lacrymal passages at the inner canthus, and taking care not to open the cyst, which is often almost immediately under the skin. The cellular substance beneath the orbicularis and the fibrous layer of the eyelids being next divided, the connexions of the cyst are to be separated. This is best effected by means of a pair of blunt forceps and a silver knife; with the former laying hold of the cyst, and with the latter destroying its cellular attachments. This being accomplished as completely round the cyst as possible, it is to be dragged forwards, and its posterior connexions divided with the knife or the scissors. The finger ought now to be introduced into the cavity left by the removal of the tumour, and an examination made, lest any indurated attachments or roots of the cyst have been left. These are to be laid hold of, and extirpated with the scissors. It is the general practice to fill the cavity formerly occupied by the tumour with lint, but this does not appear to be necessary. We may leave it filled with the blood which flows from the parts which we have divided. Its parietes will most probably inflame and suppurate, and then gradually contract; but by stuffing it with lint, the inflammation which follows is likely to be more severe and extensive, so that the contents of the orbit may suffer severely, the eye be prevented by the swelling and the matting together of the parts from retreating into its natural place, or even a new and permanent degree of protrusion of the eye be produced.

Orbital tumours are generally situated exteriorly to the ocular capsule. They lie oftener between the muscles of the eye and the periorbita, than between the muscles and the optic nerve or eyeball. When they protrude the upper eyelid, they generally lie between the levator palpebræ and the periorbita, so that the muscle runs little or no risk in the operation. Dr. O'Ferrall has pointed out, however, that when a tumour lies within the ocular capsule, the eyelid may be thrown forward in such a manner as to make the practitioner suppose the morbid growth to lie nearer to the orbit than the eyeball, and very little covered by soft parts. Proceeding to extirpation through the integuments, he may find that his incisions have to pass through a great depth of parts, to remove a tumour which actually lies in contact with the eyeball, and could be easily reached by a division of the conjunctiva.[6]

The following case, related by Saint-Yves, appears to have served as an encouraging example of extirpation of an orbital tumour to several of his successors: —

Case 211. — *Encysted tumour with three cavities.* In a girl of 12 years of age, a tumour was situated below the eyeball, so that it turned the pupil upwards, and protruded the lower lid for more than half an inch. It extended towards the cheek for the breadth of an inch. Saint-Yves divided the skin and the orbicularis palpebrarum by a semilunar incision, extending the whole length of the tumour; he then laid hold of it with a hook, separated it from its attachments with a bistoury, and removed it. With the scissors he next cut away its root, which was hard and coriaceous. In thirteen days the wound was healed. The eye returned to its place, and the patient saw with it as with the other. The tumour presented three cavities. That which lay next the skin contained a purulent fluid; the second was filled with a thicker matter, partly calcareous; and the contents of the third resembled white of egg.[7]

Case 212. — *Tumour extirpated through the conjunctiva, after disunion of the eyelids.* A woman, about 40 years of age, was admitted a patient at the Surgical Hospital of Gottingen, with her left eye very prominent, and at the same time pressed upwards and inwards. The lower fold of the conjunctiva was protruded by a hard swelling, which pressed down the lower eyelid and surrounded the eyeball from the inner canthus to the outer, and hence to the upper edge of the orbit. This swelling was somewhat moveable, and could be surrounded by the fingers, so that no firm adhesions were to be expected. The protruded eye was of natural appearance, the pupil was regular, and the iris expanded and contracted, but there was no vision.

Professor Langenbeck began the operation by dividing the outer commissure of the eyelids and the conjunctiva. After both eyelids were separated from the swelling, it was seen to be a steatomatous tumour, connected with the eyeball and its muscles. The separation from these parts was accomplished partly with the cutting edge of the scalpel, partly with its handle, and partly with the finger. The large opening left after the extirpation of the tumour was filled with charpie, till granulations appeared. The eyeball gradually retired within the orbit, and the power of vision returned so completely that the patient could distinguish the smallest object before she left the hospital. The deformity also was entirely removed.[8]

Case 213. — *Cyst evacuated, and then dissected out.* A laborious countryman was attacked with pain and dimness of sight in one of his eyes. These symptoms did not attract any particular attention for two or three years, when he became quite blind of the eye, the globe being at the same time greatly protruded, and the lower lid everted. Many surgeons who were consulted, dissuaded him from submitting to any operation, apprehensive that his complaint, if not already cancerous, was likely to become so by meddling with it. He was therefore urged not to hazard the danger of any operation, seeing that his disease did not render life intolerable, but might be supported without farther inconvenience than the want of sight in the eye, and its unseemliness from being so far thrust out of its socket. He was recommended, however, to consult Mr. Ingram, a surgeon in London, who, on carefully examining the case, imagined that he felt, on pressure, a resisting fluid under the eye, and formed the opinion that this fluid was contained in a cyst, detached from the lacrymal gland. He therefore gave encouragement to attempt the man's relief. Mr. Bromfield approved of this proposal, and, with Mr. Ingram's assistance, performed the following operation.

He pressed upwards the distorted lower lid, till it was brought as near as possible to its natural position. While it was thus held tight, Mr. B. cut through the integuments into the lower part of the orbit under the conjunctiva, till an aperture was made sufficient to permit the introduction of the finger, so as to direct a sharp-pointed scalpel, with which he perforated the tumour. Immediately a thin pellucid liquor was discharged, not far short in quantity of a small wine-glassful. Here Mr. B. paused, to give the patient a little water to cleanse his mouth from the blood, and observed that his business was not more than half done, until he should extract the cyst which had contained the water. He therefore introduced two small hooked instruments to catch hold of it, and took it completely out. The wound was filled with lint, and dry dressings, and these were secured by a proper bandage.

Within less than 24 hours the patient's head and neck were swollen to a prodigious size. Treated as a common superficial wound, in less than a month the whole was healed, and the man sent home perfectly satisfied. Mr. I. was all along, even before the operation, confident, that the overstretched muscles of the eye would, in time, recover their natural power, that the globe of the eye itself would consequently be included within its socket without leaving any outward blemish, and that even the sight would, to a certain degree, return. Dr. Brocklesby, who relates the case, owns that he gave not much credit to all this, till five months after the man went home, when, being in the country, he sent for him to satisfy his curiosity. When he saw him he scarce knew him again; for his eyelid had fully recovered its natural position and functions. About a month before Dr. B. saw him, the eye began to be sensible of the difference between darkness and bright sunshine, and ever since that period its power of perception had become gradually strengthened.[9]

Case 214. — *Double cyst extending to bottom of orbit, and containing a tooth.* Thomas Heard, a healthy-looking lad of 17, was admitted an in-patient of the Exeter Eye Infirmary, under the care of Mr. Barnes, on account of a tumour which completely obstructed the sight of his left eye. The tumour was situated beneath the eye, occupying a very considerable portion of the orbit; the eye in consequence was pushed into the upper part of that cavity, so as to be almost wholly hidden behind the upper lid. On tracing it backwards, the tumour appeared to extend to a very considerable depth, while it projected so much in front, as to constitute a striking deformity. Anteriorly it was rounded in form. A superficial groove, running obliquely across its upper surface, formed a slight line of division between the more prominent and moveable part of the swelling, and that more immediately under the eyeball. The ciliary edge of the lower tarsus, with a few scattered hairs in it, crossed the front of the tumour rather above its middle; the conjunctiva, drawn forwards from the eyeball, greatly stretched, but apparently not much altered in structure, investing it above; and a thin skin of a deep red, loaded with purple vessels, covering it below; but neither of them closely adherent to it. The portion of the tumour in front was soft, and could be moulded into different shapes by the fingers; the posterior division felt more elastic. By an effort, the patient could raise the upper eyelid a little, but not high enough to discover even the lower edge of the cornea. By lifting it up with the finger a portion of the pupil might be exposed, and he could then distinguish objects partially. The eye was apparently perfect, but he had scarcely any power of moving it. The swelling was first observed in early infancy, and was at that time not much larger than a pea. It increased slowly, until about four or five years before his admission into the Infirmary, when it began evidently to enlarge, and for some time grew rapidly. More recently it had not advanced much. It caused no pain, but, as it was a great deformity, was still enlarging, and by its presence rendered the eye useless, it was thought advisable to remove it.

In the operation a division was made of the inferior oblique muscle of the eye, which appeared stretched across the front of the tumour, having been pushed before it, in its progress from the deeper parts of the orbit. The sac adhered firmly to the outer angle and part of the lower edge of the orbit; in most other points it was but loosely connected with the surrounding parts. It was found to extend almost to the bottom of the orbit, and to occupy more of it than did the eye itself. As it was impossible to proceed in the dissection far within that cavity, without greatly endangering the eye, on account of the very narrow space between it and the posterior division of the swelling, the contents of the latter were partially evacuated, to obtain room, and the sac cautiously separated from its deeper attachments. Towards the posterior point, on the inner side, and more than an inch from the edge of the orbit, the sac felt as if it embraced a sharp bony process, arising from about the line of junction between the ethmoid and superior maxillary bones. Unwilling to proceed at hazard, the operator cut off the cyst close up to this projection, that its nature and connexions might be examined before an attempt was made to remove it. It appeared to be formed of bone terminating in a sharp point, and projecting nearly in a perpendicular direction into the cavity of the orbit. It was slightly moveable, as if attached to the periosteum only; and was removed without much difficulty, together with the remains of the sac which adhered to it. On examination it was found to be a tooth, resembling in form and size the supernumerary teeth sometimes found in the palate. The part which projected into the sac was conical, and covered by smooth, shining, white enamel; the sac firmly adhered round a contracted portion at the base of the cone, resembling the neck of a tooth; and without the sac there was the appearance of a root, truncated obliquely, with a passage in the centre, evidently containing blood-vessels. It was by this part that it was connected with the floor of the orbit. The patient had a complete natural set of teeth, though many of them were disposed irregularly.

The extirpated tumour was found to be made up of two cysts, separable by dissection, at the groove already mentioned, to some depth all round, but indissolubly united in the centre. That in front allowed the colour of its contents to be distinguished through it. The posterior sac was thicker and more vascular. The interior surface of that in front was rough, with here and there a chalky matter adhering to it. It contained a compact lardaceous yellow substance. The inner surface of the posterior sac was smooth, excepting a part near the tooth, where it had much the appearance of coarse skin with many pores in it. The contents were partly a whey-coloured fluid, and partly a yellow curdy substance. The eye did not in the least drop on the removal of the tumour; and the large cavity which this had occupied, was filled with pieces of soft sponge, dipped in oil. On removing the last piece of sponge, on the 7th day after the operation, the cavity was found to be everywhere covered by healthy granulations. The opening contracted rapidly, and the eye sunk fast, so that within a fortnight it was nearly on a level with the other. The patient was discharged in the beginning of January, with the wound perfectly healed. The lower lid did not, at that time, cover so much of the eyeball as it does naturally; and in one spot the ciliary edge was a little inverted. He had the power of moving it slightly, but he could not raise it high enough to bring it into accurate apposition with the upper. There was a considerable hollow above the eyeball; and the eye was not quite in a line with the other, but rather above it. He could not move it at all downwards, nor freely in any direction. With the exception of this inconvenience, he enjoyed with it perfect vision.[10]

Case 215.—*Encysted tumour in the orbit, complicated with symblepharon.* The eye of a man, 29 years of age, was pressed inwards and downwards by a tumour which occupied the upper and outer side of the orbit. The tumour fluctuated, and was very prominent. In consequence of previous inflammation, the cornea was opaque, and the eyelids were united to the eyeball. Professor Langenbeck divided the upper lid, over the tumour, which, as soon as it was laid bare, presented the appearance of a shining transparent cyst. He removed it perfectly entire. It was about the size of a pigeon's egg, and filled with fluid. The edges of the wound were brought together, and, after it was healed, the morbid union of the lids to the ball of the eye was divided, so that the eye was restored to its natural place and power of motion.[11]

4. *Extirpation of solid tumours.*—The extirpation of a solid tumour in the orbit may occasionally be effected by dividing merely the skin or the conjunctiva, according to the situation of the swelling, laying hold of the tumour with a hook or double volsella, or passing a ligature through it, so as to drag it forwards, and dissecting it out with a small scalpel. In other cases it is necessary, in order to effect the extirpation of the tumour with ease, first to disunite the eyelids by an incision, carried from their outer angle towards the temple. The conjunctiva covering the tumour is thus completely exposed, and all the remaining steps of the operation effected with less difficulty.

When the tumour lies close to the bones of the orbit, and is perhaps adherent to the periorbita, the extirpation is more readily effected by cutting through the eyelid in a direction parallel to the fibres of the orbicularis palpebrarum, and along the edge of the orbit, leaving the conjunctiva untouched. A perpendicular division of the lid covering the tumour has sometimes been had recourse to, but ought rather to be avoided. The tumour is to be extirpated, if possible, without injuring the parts in its neighbourhood, or to which it adheres. They are to be separated from it by cautious touches with the point of the scalpel, with a silver knife which serves to tear rather than cut, or with the finger-nail. But if the adhesions be inseparable, the parts to which the tumour adheres must be sacrificed. Even the eyeball will sometimes require to be removed. No portion of the tumour ought to be left, else the disease will be apt to be reproduced. After the tumour is extirpated, the displaced eyeball sometimes returns immediately to its natural situation, and recovers its power of motion; but in general this is effected not at once, but slowly, in the course of several weeks or even months, and may sometimes be assisted by the application of a compress and bandage.[12] The removal of the pressure caused by the tumour is in some cases followed, more or less immediately, by restoration of the sight of the eye; while, on the other hand, I have known the swelling and inflammation, subsequent to extirpation of an orbital tumour, produce for a time a greater degree of displacement than had previously existed, and a total loss of vision, in an eye with which, although much displaced, the patient had continued to see till the operation. The severe inflammation which sometimes follows the extirpation of an orbital tumour may even extend to the brain or its membranes, and prove fatal.[13]

Case 216.—*Fibrous tumour in orbit, extirpated at twice.* John Searle, aged 28, was admitted into the Royal Ophthalmic Hospital, Moorfields, London, under the care of Mr. Critchett, August 25th, 1852. In the lower half of the right orbit was a large, ill-defined solid tumour, by which the eye was considerably protruded, and forced upwards and outwards. The upper lid was distended and tense, while the lower was everted, and its conjunctiva exposed. The eye was so much displaced that he could look only upwards; he had, however, perfect vision in that direction. The protrusion of the eye had first been noticed fifteen months previously, and the growth of the tumour had not been attended with more pain than was accounted for by its pressure on the surrounding parts. As far as he knew, he had never received any injury on the part. His general health had not at all degenerated, he thought, since it began to grow. It was decided at a consultation, to make an exploratory incision into the tumour, and to attempt its removal or not, as might then appear desirable.

As the patient believed himself quite able to bear the pain of the operation, chloroform was not administered. Mr. Critchett first divided freely the everted conjunctiva of the lower lid, and dissecting it off, brought into view a firm, whitish growth. When this had been, with care, separated from the surrounding parts, and several large portions of it removed, it was found to extend very deeply into the orbit, being apparently attached to the sheath of the optic nerve. Considerable hæmorrhage took place during the dissection, and the pain was so great that the patient became unmanageable. It was deemed, therefore, best to desist, and the cavity having been stopped with lint, the patient was sent to bed.

The portion of the growth which had been removed was firm, rough, and of a pale gray colour; exhibiting, when torn, the appearance of radiating bands of parallel fibres. Under the microscope, it seemed made up of white fibrous tissue, with many elongated cells. Scarcely any constitutional disturbance followed the operation; the lower lid, and the parts in the lower half of the orbit, however, became very much swollen; and, from the latter, a large slough separated. When the hollow left by the separation of the slough was nearly filled up, the man became an out-patient; and the tumour having soon afterwards increased to nearly its former size, he was transferred to the London Hospital, with a view to a second operation.

The lower lid was now everted as before, and exposed a florid and much thickened conjunctiva. The tumour, although it had increased rather rapidly, showed no tendency to ulcerate or bleed. It had latterly, by pressing on the globe, produced very much pain, and the man was extremely anxious that some operation should again be attempted. Mr. Critchett, having apprised him, that, from the deep attachments of the growth, the integrity of the eye would be much endangered in the dissection necessary for its removal, consented to make another trial. The patient having been placed under the full influence of chloroform, the thickened conjunctiva was dissected from the whole front of the tumour. Mr. C. then carefully divided, without injury to the globe, the adhesions between the tumour and the surrounding parts; having freed it to a considerable extent, he next seized it with toothed forceps, and made pretty firm traction, endeavouring, at the same time, with a pair of blunt-pointed, curved scissors, to separate its posterior attachments. A mass, of the size of a large walnut, was removed, which, as it was surrounded in most parts by a distinct fibrous envelope, probably included the whole of the growth. It presented much the same appearances as the portion formerly extirpated, save that, while not quite so firm in its general texture, it contained in its substance numerous particles of bone. There were also a few very small, smooth-walled cysts. No spots of ecchymosis existed; it yielded no juice, and was with difficulty disintegrated by pressure.

The operation was followed by a pretty acute suppuration of the cellular tissue of the orbit, which, during the first fortnight, occasioned considerable swelling; accompanied, however, with very little constitutional disturbance, and no inflammation of the eye itself. At the end of that time, the tumefaction began to subside, and the eye gradually receded. About the end of September, the eye had resumed its natural place, or was, if anything, a little more sunk than the other. Vision was perfect; but, owing to the injury which the inferior rectus had sustained, the eye was directed a little upwards. He could roll it with ease in every direction excepting downwards.

A second microscopic inspection of the growth, made after the last operation, coincided in its results with the former one. There could be little hesitation, therefore, in assigning it to the class of fibrous tumours, of which it was one of the loose-textured, cyst-containing variety, which had, as is not unusual, undergone interstitial calcification in many parts.[14]

Case 217.—*Tumour extirpated through a perpendicular incision of the upper eyelid —Disease returns.* Dr. Monteath shortly states the case of a young girl, who had a tumour on the upper and outer side of the orbit. In order to get at it, he was obliged to cut through the whole perpendicular length of the upper eyelid, and dissect back the two flaps. The tumour was nearly the size of a plum, and reached as far back as the eyeball. It was slightly encysted, perfectly organised, and of anomalous texture. The healing of the wound was rapid, and contrary to expectation, the eyelid reunited perfectly, and regained very nearly its natural power and extent of motion. The eyeball did so also, and the vision was perfect. The patient went to England some months after, and Dr. M. was concerned to learn that the tumour had begun to grow again.[15]

Case 218. — *Tumour returns from not being completely extirpated — Operation rendered difficult by patient's resistance.* Mr. Wardrop relates, that a young woman, of a robust form, had a tumour on the orbital plate of the left frontal bone, the base of which adhered firmly to the bone, whilst the exterior portion was attached to the integuments, in which there was a small sinus leading into the interior of the tumour. The diseased mass did not exceed the bulk of an almond, but it was attended with great pain, and even cautiously touching the orifice of the sinus with a probe excited violent irritation. A tumour had been extirpated from the seat of this swelling some months previously, a portion of which, adhering to the bone, being left behind, gave origin to this new growth. Though she had come from a distance, determined to get the disease removed by an operation, if it was considered advisable, yet when the scalpel touched the integuments, she made a violent resistance. A second attempt was made, she being previously secured on a table with numerous assistants; but such was the force and exertion she made to extricate herself, whenever the operation was about to be begun, that every hope of success was abandoned. It now occurred to Mr. W. as the only resource, (the anæsthetic use of ether or chloroform not being at that time known), that if she would allow herself to be bled to a state of deliquium, the tumour might be extirpated while she remained insensible. After a few days she submitted to this measure. A large vein was freely opened while she sat in the erect posture, in a very warm room, in which there were seven people, with the doors and windows kept shut to hasten her fainting. No less than 50 ounces of blood were drawn before she fainted, and then a complete state of syncope came on, which lasted a sufficient time to allow the tumour to be removed. The operation was accomplished with great facility; and in order to promote an exfoliation of the diseased portion of bone, its surface was rubbed over with kali purum. When the fainting went off, she would not believe that the operation had been performed, until she had examined her face in the glass. She suffered little from the effects of the operation; and though she remained pale and feeble for a few days from the profuse bleeding, yet in a week she was better than most patients are who have undergone so severe an operation.[16]

Case 219.—*Tumour encircling optic nerve — Eyeball extirpated.* A young adult woman consulted Dr. Monteath on account of an orbital disease of two years' standing, which had produced hideous exophthalmos. It was found impracticable to extirpate the tumour without also removing the eyeball, which was accordingly done. The tumour exceeded the size of the eyeball, lay directly behind it, and so completely encircled the optic nerve, that the latter was diminished one half in thickness by the pressure. Vision had been rapidly declining previously to the operation. The tumour was exceedingly hard, of anomalous texture, and surrounded by a layer of condensed cellular substance. The anterior surface of the tumour touched and pressed upon the posterior surface of the eyeball, but had no connexion with it except through the medium of the optic nerve and cellular substance. Twenty months after the operation, the patient continued well.[17]

Case 220. — *Death from erysipelas after extirpation of an orbital tumour.* Sir George Ballingall, in a clinical lecture delivered to the students of the Royal Infirmary of Edinburgh, in March, 1828, and afterwards printed for their use, states that, on the 12th of November, 1827, James M'Intosh was admitted with a soft moveable tumour impacted between the roof of the orbit and globe of the right eye. The superior eyelid was protruded outwards and considerably inflamed, as well as the conjunctiva covering the surface of the tumour; the ball of the eye was depressed by the swelling towards the cheek. The structure of the eye appeared perfectly sound, and the vision unimpaired, except in so far as it was partially obstructed by the projection of the tumour, which obliged the patient to throw back his head, and to elevate his face, in attempting to see objects placed before him. He knew of no accident to which this complaint could be attributed, assigning its origin to exposure to cold in the month of January preceding. In July, he had been in the Infirmary, at which time the tumour occupied the site of the lacrymal gland, and was not above a fourth of the size it had attained in November. He was urged to have it removed, but would not consent, although told that he would, in all probability, return with it at a future period, when the operation would be more difficult. This accordingly happened; and in November he was solicitous for its removal.

The operation was begun by dividing the superior palpebra upwards and outwards from the external canthus. After dissecting the eyelid from the surface of the swelling, the tumour was, with much difficulty, separated from the contiguous parts; a pedicle or neck, by which it was found adherent to the very bottom of the orbit, was then cut across with a pair of probe-pointed scissors, and some small portions of it afterwards removed.

The operation was followed, in the first instance, by a very moderate degree of swelling and inflammation, much less, indeed, than was to be anticipated. For nearly a week the case had a favourable aspect, but, at the end of this time, the forehead and upper part of the face became involved in erysipelatous inflammation, which extended over the whole head, accompanied with delirium, the pulse rising as high as 150. It was observed, soon after the operation, that the patient's breath was imbued with the mercurial fetor, which he attributed to some medicines taken before his admission. The urgent symptoms were somewhat alleviated by bleeding, both general and topical, the internal exhibition of antimonials and saline purgatives, the application of a blister to the nape of the neck, and the use of an anodyne fomentation to the inflamed parts. On the 22nd, he had sunk so low, that he was not expected to live through the night; his pulse 120, his breathing laborious, and his extremities cold, with low muttering typhoid delirium. From this state he again rallied under the use of brandy and water, beef tea, and the application of a second blister to the nape of the neck. A copious discharge of unhealthy matter had for some days been going on from the affected eye, the cornea of which now ulcerated, and on the morning of the 27th, the crystalline lens was discharged through the opening. His delirium continued, with occasional intermissions, during which he asked for and devoured food with a ravenous appetite. His pulse continued frequent and weak, his breath fetid and offensive, and his general appearance resembling that of a patient in the advanced stages of typhus. The cuticle separated in crusts from those parts of the head and face in which the inflammation had been seated; rigors and diarrhœa latterly supervened, and he expired on the evening of the 28th.

Permission could not be obtained to examine the body; but a hasty examnation was made of the head and parts concerned in the operation. A portion of the principal tumour was found still adherent to the sheath of the optic nerve, and several small melanotic tubercles imbedded in the fatty matter surrounding the muscles of the eye. Some serous effusion had taken place both on the surface and into the ventricles of the brain. Sir George remarks, that if he had been fully aware of the nature of the disease, and of the deep attachment of the tumour, he should have proceeded at once to extirpate the whole contents of the orbit; but having succeeded in removing the bulk of the tumour with safety to the eyeball, he felt reluctant to change the plan of the operation. The inflammation immediately succeeding to the removal of the tumour, was much less than was to have been expected from so severe an operation, but when the symptoms of erysipelas supervened, it was obvious that the case beeame one of a very perplexing and hazardous description. The patient's system, surcharged with mercury, precluded the employment of mercurial purgatives, so often beneficial in erysipelatous inflammation, and it had been remarked, that, even when in the hospital in July, he had something of that sallow cachectic look often attendant upon internal organic disease, and which rendered him, in Sir George's estimation, an unfit subject for profuse evacuations of blood.[18]

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[1] On Encysted Tumours, consult Walther, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. iv. p.386; Berlin, 1822: Lawrence, Medico-Chirurgical Transactions; Vol. xvii. p. 43; London, 1832.

[2] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. vii. p.235; Berlin, 1825.

[3] Nosographie Chirurgicale; Tome ii. p. 119; Paris, 1813.

[4] Cases and Observations in Surgery, p. 104; London, 1806.

[5] Delpech, Chirurgie Clinique de Montpellier; Tome ii. p. 505; Paris, 1828.

[6] Dublin Journal of Medical Science, Vol. xix. p. 352; Dublin, 1841.

[7] Nouveau Traité des Maladies des Yeux, p. 147; Paris, 1722.

[8] Neue Bibliothek für die Chirurgie und Ophthalmologie; Vol. ii. p. 238; Hannover, 1819.

[9] Medical Observations and Inquiries; Vol. iv. p. 371; London, 1772.

[10] Medico-Chirurgical Transactions; Vol. iv. p. 316; London, 1813.

[11] Neue Bibliothek für die Chirurgie und Ophthalmologie; Vol. ii. p. 40; Hannover, 1819.

[12] See case by Hope, in which after extirpation of an orbital tumour, the eyeball was restored to its place by the pressure of a steel bandage; Philosophical Transactions for 1744 and 1745, Vol. xliii. p. 194; London, 1748.

[13] See case by Robertson, in which purulent effusion on the surface of the brain took place after extirpation of the eyeball, along with an orbital tumour; Northern Journal of Medecine, December 1844.

[14] Medical Times and Gazette, November 6, 1852, p. 465.

[15] Translation of Weller's Manuel; Vol. i. p. 195; Glasgow, 1821.

[16] Medico-Chirurgical Transactions; Vol. x. p. 275; London, 1819.

[17] Op. cit., Vol. i. p. 196.

[18] On Orbital Tumours, see Acrel's Chirurgische Vorfälle, übersetzt von Murray; Vol. i. p. 88; Göttingen, 1777: Hedenus, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. ix. p. 267; Berlin, 1826: Delpech, Op. cit., pp. 92, 99.

SECTION II. — OSSEOUS TUMOURS IN THE ORBIT.

Mr. Lucas has related the following case of bony tumour, arising after an injury, and successfully extracted from the orbit: —

Case 221. — The patient was a farmer's daughter, 28 years of age. On the 25th of February, 1809, she received a blow from a cow's horn on the upper and inner angle of the left orbit, nearly on the transverse suture. As the pain soon subsided, it was considered merely a slight contusion, and little attention was paid to it. About the beginning of March, there was discovered on the spot where the blow had been received, a small hard tumour, which gradually increased, with very little pain and no interruption to her general state of health, so that she continued her usual laborious employments about her father's house. On the 1st of October, she consulted Mr. L., who found, covered by the upper eyelid, a very hard tumour, of an oval form, and rather flat, somewhat more than an inch in its perpendicular diameter, and extending horizontally about an inch and a half in length, from the inner angle of the orbit towards the eyeball, which was displaced. The tumour seemed to occupy the greater part of the orbit, and had forced the eye forwards and outwards, so that it hung pendulous and loose, and apparently entirely beyond the exterior edge of the outer angle of the orbit. Mr. L. concluded that the optic nerve and muscles must have been elongated nearly an inch. She could still discover objects with the eye, although its sight was much impaired. She complained of little pain, even when the tumour was pressed or handled pretty freely.

Mr. Lucas resolved to ascertain the nature of the tumour, which, although hard, appeared somewhat loose. With this view he made a horizontal incision through the upper eyelid, about an inch in length, along the greater diameter of the tumour. On separating and raising the edges of the wound, the tumour was discovered to be a solid piece of bone, covered only by the common integuments, and a thin membrane somewhat resembling periosteum, to which the tumour was but slightly attached. No part of the bones of the orbit was denuded; and although the manner of the adhesion of the tumour to the surrounding parts could not be ascertained, it remained firm and immovable, notwithstanding considerable efforts to loosen it and bring it away. The wound made by the incision did not heal up, but continued nearly of its original size, discharging a small quantity of thin matter. The bone continued to increase in size, and the eye was still more pushed out of its natural position, although some degree of sight still remained. The patient continued in perfect health. At length, towards the end of September, 1803, the bone becoming carious and evidently loose, and pushing somewhat forwards, Mr. L. endeavoured to extract it, by making, with a small scalpel, an incision around the edges of the former wound, and then taking firm hold of it with a pair of strong forceps. The first attempt failed; but a second, made several days afterwards, succeeded. Mr. L. extracted, without much exertion or difficulty, a piece of bone, of an oblong shape, weighing 1 ounce and 2 drachms, 1½ inch in length, and 2⅝ inches in circumference, hard, solid, and pretty smooth. The extraction of the bone was followed by no hæmorrhagy; a few drops of blood only were discharged from the edges of the wound. The cavity from which it was extracted was found to be lined with a strong membrane, quite smooth on the upper and inner sides, but somewhat uneven on the side next the ball of the eye. No perforation or communication with any of the surrounding parts could be discovered in it; when examined both with a probe and the finger, little irritation or pain was produced, and the tumour had evidently no connexion or adhesion with any bone adjoining to it.

In March, 1805, when Mr. L. published his account of the case, the wound was still open, and the cavity still extended in a straight direction backwards to the depth of two inches. A little lint, covered by a bit of silk, hid the deformity. Every time the dressing was removed, the inside of the cavity was found to be covered with a slight exudation. The eyeball had in a great measure recovered its natural situation, and the sight of the eye had been completely restored.

The bone extracted in this case was particularly examined and analyzed by Dr. Duncan, junior, who published two figures illustrating its external appearance and internal structure. Its shape he represents as extremely irregular, but somewhat resembling a wedge cut out of a sphere. The convex back of the wedge, which was turned towards the middle line as it lay in the orbit, although extremely irregular and studded with processes, was in general smooth and polished. The sides were concave, and much less uneven, but in no part had a smooth or polished surface. They resembled those points of bone to which cartilage, ligament, or membrane is firmly attached, being covered with small pits or depressions, and rough, as if corroded by the action of a caustic fluid. In no part, after the most careful examination, did it show any appearance of fracture, and therefore (concludes Dr. D.) could not have been an exostosis. Its colour was yellowish-white; its sawdust snow white. It was extremely hard. When cut, its internal structure, was found to be nearly uniform, somewhat like that of ivory, being very slightly marked with the appearance of radii, extending from the middle of the edge to the convex back of the wedge. It admitted of being polished like ivory. In specific gravity and chemical composition, it scarcely differed from a piece of adult os femoris.[1]

Case 222. — At the Glasgow Eye Infirmary, July 5th, 1844, Dr. A. Anderson extirpated an osseous tumour from behind the lower eyelid. It always sank back out of reach of feeling through the eyelid, till the upper eyelid was pressed back into the orbit. It then became prominent. It was smooth externally, about $\frac{4}{10}$ inch in diameter, and presented, on being divided, layers of cartilage and bone.

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[1] Edinburgh Medical and Surgical Journal; Vol. i. pp. 405, 407; Edinburgh, 1805.

CHAPTER IX.

MALIGNANT DISEASES OF THE AREOLAR AND FIBROUS TISSUES OF THE ORBIT.

SECTION I. — SCIRRHUS IN THE ORBIT.

The areolar and fibrous tissues of the orbit are liable to become the seat of scirrhus, encephaloid cancer, and melanosis. Liable as those tissues are to the many and various morbid affections already considered, the fact of their being also occasionally involved in malignant growths, so multiform as those now mentioned, adds greatly to the difficulty of accurate diagnosis in diseases of the orbit.

In general, only one kind of malignant disease occurs in the orbit at once; but in some cases, they are complicated, either one with another, or with encysted tumours. Encephaloid tumour is deposited in some instances on a scirrhous base; and not unfrequently melanosis is combined with encephaloid tumour.

A remarkable circumstance is, that in some cases not only the areolar and fibrous tissues are affected, but also the muscles, and the lacrymal gland; while the eyeball merely shrinks from compression, its textures remaining totally free from the malignant degeneration.

The areolar tissue near the front of the orbit sometimes becomes hard, tuberculated, and scirrhous. Behind the eyeball, it has been found in the same morbid condition. The whole of the areolar and fibrous tissues between the walls of the orbit and the eyeball may become infiltrated with scirrhous deposition, compressing the eyeball, and protruding it from the orbit.

Case 223. — A piece of limestone struck the outer edge of the orbit, producing a lacerated wound of no great extent, and which readily healed. Some time after, a small hard swelling formed at the site of the injury, was extirpated, and was found to contain a minute fragment of limestone. After some months, another small tumour made its appearance in the same spot, and in connection with it another, attached so firmly to the edge of the orbit, that it was taken for an exostosis. In a few weeks, a third circumscribed swelling was discovered running along the lower edge of the orbit, more moveable than that last mentioned, but as firm to the touch as a piece of cartilage. The patient was under the care of Mr. Samuel Clarke, whom I assisted at the removal of the tumours. The two which felt so like exostoses, lay partly within the orbit, and adhered firmly to its periosteum. On making a section of them, they presented the white striated texture of scirrhus. The extirpation was accomplished after a semilunar incision, running parallel to the outer and lower edge of the orbit, and every particle of indurated substance was carefully removed. More than a year after the operation, there was no return of the disease.

Case 224.—William Cullen, aged 44, was admitted a patient at the Glasgow Eye Infirmary, 31st July, 1835, on account of catarrho-scrofulous inflammation of his left eye, a large portion of the cornea being rough and opaque. He continued to attend till the 15th November, the eye having improved by the use of leeches to the temple, a blister behind the ear, Plummer's pill, the collyrium hydrargyri, and red precipitate salve, but the cornea still continuing nebulous.

On the 29th July, 1841, six years after his former attendance, he returned with the left orbit filled with a large hard tumour, protruding the eyeball and eyelids, and adhering apparently all round to the periorbita. The lids were much extended both vertically and horizontally, covered with varicose vessels externally, and so much pressed upon by the tumour, that scarcely any of their inner surface could be exposed. The conjunctiva, especially towards the inner canthus, was swollen and lobulated; the cornea, scarcely visible; and the bulb of the eye, apparently in a great measure disorganised. The tumour, which filled the orbit, was judged to be an enlargement of the eyeball; but this the event showed to be a fallacy. The seemingly enlarged eyeball was excessively hard, and projected fully ½ inch out of the orbit. Its surface was very irregular, and its motion very limited. Vision was almost completely extinct, yet, even with the lids closed, the patient could discern light and shade with the eye. The lower lid, towards its inner extremity, appeared to be carcinomatous, and under the internal angular process a portion of the tumour was still harder than the rest, and more firmly adherent to the periorbita. The patient stated that the tumour had commenced several years before, between the eye and the nose, with a growth on the white of the eye, and that the eyeball previously to the tumour appearing had shrunk in size. He did not, in general, seem to suffer much pain, but stated that frequently he felt a suppurative pain in the eyeball. Pulse 72. General health good.

2nd August. The external commissure of the left lids being divided, a curved needle, armed with a strong thread, was passed through the eyeball. The lids were then dissected from the eyeball, and the upper lid being divided vertically near the union of its inner third with its two outer thirds, the tumour, including the eyeball, was detached and extracted. Its connection with the periorbita appeared to be entirely by firm carcinomatous substance. In endeavouring to dissect away what remained attached to the walls of the orbit, the ophthalmic artery bled very freely, and the patient became faint. The eyelids in almost their whole extent were affected with the carcinomatous degeneration, and were removed. The orbit was stuffed with dry lint, and firmly covered with a compress and roller.

On examination of the diseased structure, the sclerotica and parts within it were found to be sound, the lens transparent, and the retina entire, but the eyeball reduced to about two-thirds of its normal size by the pressure which had been exercised upon it by the diseased parts. The areolar tissue of the orbit and the conjunctiva were converted into a substance of a gristly consistence, with white bands running through it, and the muscles were much indurated, and immoveably fixed in the cancerous mass.

The remains of the eyelids soon began to contract, and the patient was dismissed on the 7th September.[1]

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[1] See a similar case by Roux, Revue Médicale; Tome iv. p. 398; Paris, 1832.

SECTION II. — FUNGUS HÆMATODES IN THE ORBIT.

Mr. Travers tells us that the adipose tissue behind the eye is the frequent seat of fungus hæmatodes, or, as he terms it, medullary cancer. "An extraordinary globular tumour," says he, "is formed around the ball, of which the perished cornea forms the centre. It projects, stretching and so separating the lids, that they gird tightly the base of the enormous swelling. I have seen children subjects of this affection. The growth is sometimes confined to the upper or frontal aspect of the orbit. The upper lid is then prolonged and stretched over the globe so tightly that it is difficult, if practicable, to obtain a view of the latter. The medullary matter is of a granular or ricy consistence, and pervades and destroys the muscles, periosteum, and finally the bony vault of the orbit. I have seen its extirpation boldly performed; but its re-appearance has been almost immediate, and its progress quick to destruction."[1]

Fungus hæmatodes has been met with, affecting the substance of the optic nerve, while the eyeball remained sound[2], and, in other cases, it has been seated within the sheath, which the optic nerve derives from the dura mater, the nerve itself not being affected.[3] Such a growth in an advanced stage, will not only fill the back part of the orbit, but project by the side of the protruded eye, giving rise to the appearances described by Mr. Travers.

Exactly as the areolar and fibrous tissues of the orbit are sometimes infiltrated by scirrhous deposition, so are they in other cases by encephaloid. The following instance of this is recorded by Dr. Robertson: —

Case 225.—In Mrs. Walker, aged 62, the left eye had been in a weak state since childhood, and had been the subject of repeated attacks of inflammation, which had always yielded to the usual remedies. After the last attack of inflammation, and about three years before having the contents of the orbit removed, a fleshy elevated ring formed round the cornea, and remained stationary for about a year and a half; it then began slowly to enlarge, and continued to do so in spite of leeches, blisters, mercurials, and every kind of lotion. The swelling appeared to have proceeded from the margin of the cornea backwards, gradually projecting the eye from the socket. For two years she had suffered from severe lancinating pains passing from the eye to the temple and occiput. The transparency of the cornea and the functions of the retina remained unimpaired until about three months before the operation, when vision failed, the cornea becoming opaque, probably in consequence of the inflammation caused by the constant exposure of the eye to the air and light, the lids being no longer capable of closing over the eyeball. Her health and strength had been failing under constant pain and want of sleep. After excision of the contents of the orbit, she made a rapid recovery. She died from general decay, without any marked disease, twelve years after the performance of the operation.

On making a transverse section of the eyeball after excision, its membranes and their contents were found perfectly healthy. Exterior to the sclerotic, and under the conjunctiva, the eye was surrounded by a dense mass of medullary sarcoma.[4]

The periorbita is sometimes the structure whence encephaloid cancer takes its rise; and in this case the bones are apt to suffer. Occasionally the tumour which fills the orbit originates from one or other of the neighbouring cavities; and this may not be detected till an attempt is made at extirpation.

[1] Medico-Chirurgical Transactions; Vol. xv. p. 238; London, 1829.

[2] Wishart, Edinburgh Medical and Surgical Journal; Vol. xi. p. 274; Edinburgh, 1833. Schott states (Controverse über die Nerven des Nabelstrangs; Advertisement at the end; Frankfurt am Main, 1836,) that he extirpated the eye in a case where fungus hæmatodes formed a tumour as big as a hen's egg in the optic nerve, from the foramen opticum to within an inch of the eyeball. He removed the whole contents of the orbit in 1829, and the patient continued well in 1836. As the optic nerve from the foramen opticum to the sclerotica measures only 1¼ inch in length, to permit of the formation of such a tumour the nerve must have undergone an extraordinary degree of elongation, within a very limited portion of its normal extent.

[3] Panizza, Annotazioni Anatomico-Chirurgiche sul Fungo Midollare dell' Occhio, pp. 106, 107; Tav. iii. fig. 1; Pavia, 1821.

[4] Northern Journal of Medicine, December, 1844, pl. vi., fig. 14, and pl. vii., fig. 15. See case by Velpeau, Annales d'Oculistique, 1er vol. supplémentaire, p. 16; Bruxelles, 1842. Case by Maisonneuve; Ibid., p. 19. Case by Jacob; Dublin Medical Press, December 25, 1850, p. 402.

SECTION III. — MELANOSIS IN THE ORBIT.

Case 226. — A fatal case of melanosis of the liver is recorded[1] by Chomel, in which the cellular membrane of the orbit was affected with the same disease. The right eye was inflamed, and projected remarkably from the orbit. An abscess occupied the lower third of the cornea, and the patient saw very obscurely with this eye, behind which there was found, on dissection, a round melanotic mass, about an inch in diameter. It seemed to be formed at the expense of the cellular membrane at the bottom of the orbit, and had displaced the optic nerve, without altering its texture.

Case 227.—A farmer, aged 51, had complained, twenty-five years before, of loss of vision, and slight projection of the eyeball, which symptoms yielded to the use of iodine. Since that time, the eyeball had been very prominent at two other periods, but was again replaced by the same remedies. It had now protruded from the orbit for two years, and notwithstanding every effort to reduce the tumour, the eye was continuing to advance. When the contents of the orbit were removed by M. J. B. Fife, the eye was projected beyond the lids by an elastic fungoid tumour, which, covered by the thickened and congested conjunctiva, encircled the eyeball in such a manner that the cornea was alone visible. Until within a few months preceding the operation, no pain attended the progress of the disease.

The whole of the contents of the orbit were removed without difficulty. The hæmorrhage was very profuse, but quickly ceased on plugging the cavity. The tumour entirely filled the orbit, and on being cut open was found as black as coal; it was encrusted with a covering of cellular tissue, which also ran into the interior of it, separating the whole into lobules; in structure it was soft, and consisted of a cellular tissue, infiltrated with pigment, which was readily washed out of the tissue when incised. The pigment under the microscope exhibited innumerable dark-brown organic granules, existing singly, or aggregated together in compound granular cells of great variety of size and form, together with numerous oil globules, with faint outlines, containing in their interior small shining granules, and occasionally other smaller cells of similar appearance to themselves; also cells of varying size, with thick dark-brown walls, only very slightly transparent, and containing in the cell-walls numerous dark granules, and occasionally nuclei. These latter cells appeared as if they were the colourless cells transformed by growth and the acquisition of pigment into the peculiar cell of melanosis.

Three months after the operation, the patient reported himself as being quite well.[2]

With respect to the propriety of operating in cases of malignant diseases affecting the areolar and fibrous tissues of the orbit, notwithstanding the success which has in a few instances attended the removal of the diseased parts, the practice is in general not to be commended. It is in adults only, and even in them very rarely, that the extirpation of malignant growths from the orbit has been attended with permanent recovery. A case of apparent success in a child affected with medullary cancer in the orbit, in whom extirpation was performed by Mr. Lloyd, was published in the Medical Times and Gazette, November 6, 1852; but in the same periodical for July 16, 1853, it is stated that the disease returned, even before the child left the hospital. Within a month of the time when she returned home she was seized with head symptoms, and died, a large mass of soft cancer being found in the brain.

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[1] Nouveau Journal de Médecine; Tome iii. p. 41; Paris, 1818.

[2] Medical Gazette; Vol. xlvii. p. 344; London, 1851.

See case by Lightfoot, of melanotic tumour of the orbit, unconnected with the eyeball; Medical Times and Gazette, September 4. 1852; p. 248. Case by Wordsworth, in which operation was abandoned, after exploratory incision, and microscopic examination of a small portion of the tumour; Ibid., May 21. 1853, p. 525.

CHAPTER X.

INTRAORBITAL ANEURISMS.

SECTION I. — ANEURISM OF THE OPHTHALMIC ARTERY.

LIKE the internal carotid by the side of the sella Turcica, the anterior cerebral, and other arteries within the cranium, the ophthalmic artery within the orbit is subject to true aneurism.

Case 228. — Mr. Guthrie[1] saw a case, in which both ophthalmic arteries were dilated, and which terminated fatally. The symptoms were similar to those of aneurism by anastomosis, but no tumour could be perceived. The eye was protruded until it seemed to be exterior to the orbit, but vision was scarcely affected. A hissing noise in the head could be distinctly heard, and was attributed to aneurism. On the death of the patient, an aneurism of the ophthalmic artery was discovered on each side, of about the size of a large nut. The ophthalmic vein was greatly enlarged, and obstructed near where it passes through the sphenoid fissure, in consequence of a great increase of size which the four recti muscles had attained, accompanied by an almost cartilaginous hardness. This state of the muscles had been as much concerned in the protrusion of the eye as the enlargement of the vessels. The disease existing on both sides prevented Mr. Guthrie from proposing any operation on the carotid, to which indeed, he thinks, the patient would not have submitted.

Case 229. — Mr. Busk records a case of aneurismal tumour in the orbit, which he regards as having been a true aneurism of the ophthalmic artery, or of some one of its branches. In consequence of a severe blow on the right side of the head, from the gaff of the vessel to which he belonged, a seaman, aged 20, became affected with insensibility, which continued till next day, hæmorrhage from the right ear, deafness on that side, palsy and numbness of the left side of the face, and palsy of the muscles of the left eye. In consequence of the palsy of the orbicularis, the left eye inflamed, an onyx formed, and the lower half of the cornea became opaque. More than six months had elapsed from the time of the accident, when Mr. B. detected a distinct pulsation of the globe, and on more close examination, a firm pulsating tumour in the upper and inner part of the left orbit, immediately within the superciliary ridge. It measured about $\frac{1}{2}$ inch in its long diameter, appeared to be situated between the levator of the eyelid and the bone, and was not visible externally. When the eyelid was raised, it caused some projection of the conjunctiva. Its pulsation was accompanied by a distinct thrill, which could also be felt on pressing the parts in its immediate neighbourhood. Through a small ivory stethoscope it gave a loud whizzing sound, which could be heard also on applying the instrument over the inner canthus of the right eye, and on the left side of the frontal bone, as high as the roots of the hair, and nearly as far back as the ear. The eye felt hot and uneasy; but, otherwise, the patient had no pain, and complained principally of noises in the head.

As pressing on the left common carotid stopped the pulsation in the tumour and eye, as well as the sounds heard through the stethoscope, and the tinnitus aurium, it was clear they depended on a common cause, and, probably, on an aneurism of some vessel within, or close upon, the orbit. Mr. B. therefore tied the common carotid; two days after which, no remains of the tumour could be felt, all pulsation was gone from the orbit, no sound could be heard by means of the stethoscope, and the internal noises were removed. The eye became less vascular, and not so prominent. The cure of the aneurism was in fact complete.

Mr. B. is inclined to think, that not only this case, but also the cases (see next Section) operated on by Mr. Travers and Mr. Dalrymple, were instances not of aneurism by anastomosis, but of true aneurism. He grounds this opinion on the following particulars: — 1. The sudden accession of the disease, attended with pain. 2. Its rapid increase. 3. The powerful pulsation in the tumours, when recent and small. 4. The strong aneurismal whizzing sound, which, in his case, was heard over so extended a space.[2]

With regard to these arguments, it may be remarked, that both strong pulsation and distinct arterial susurrus attend aneurism by anastomosis. Rapid increase of the symptoms might attend both true and anastomotic aneurism. The suddenness of the attack is the fact most indicative of true aneurism in the cases in question.

The following case has been published as one of true aneurism within the cavity of the cranium. The part which the eye took in the disease will vindicate my introducing it here.

Case 230. — In 1836, the patient had become subject, at irregular periods, to pain over the right eye, which gradually increased, both in frequency of occurrence, and in attendant suffering. Before the expiration of the second year, the eye was considerably protruded from the orbit. In 1839, the right temple, as well as the eye, was morbidly prominent, and about this time the pain became so excruciating, as to occasion delirium, one attack of which was protracted to 15 days. Occasional severe pain was at this period experienced also in the left side of the face and temple. During the winter of 1838-9, for a number of weeks, the patient's suffering was incessant, but was, finally, much lessened after a copious spontaneous discharge, from the nostrils, of a yellow fluid. Increased suffering, ever after, succeeded to any interruption of this nasal discharge. His right eye became entirely useless in regard to distant objects, and in his right ear he was perfectly deaf.

To the examiner, the first object which at this period attracted attention, was the protruded eye, which was about ½ inch in advance of the other. The inferior and external portion of the os frontis, including the orbitar plate and the external half of the superciliary ridge, along with corresponding portions of the parietal, temporal, and sphenoid, separated from the bodies of these bones, were involved in one common enlargement of the temple and side of the head. The whole of the enlarged mass communicated to the touch the thrill, characteristic of aneurism, while the eyeball, viewed laterally, presented an alternate protrusion and recession, corresponding to the action of the heart.

Much of the suffering of the patient was allayed by the treatment preparatory to operation, consisting in the use of plainly dressed, easily digested food, in moderate quantities, with such evacuants as were necessary to place the digestive organs in a favourable state; and in the month of January, a ligature was applied to the common carotid artery, by Professor Dudley of Lexington. The effect of the ligature was immediately sensible in the eye, and all the right side of the head and face. The eye gave no more evidence of pulsation, the circulation in the integuments immediately became languid, and the tenseness of the whole parts involved n the enlargement was greatly lessened; while the patient expressed himself as being suddenly relieved of all noise and motion in the head.

The rapid subsidence of the tumid state of all the parts involved, by the end of the first week after the operation, rendered manifest the changes they had undergone. Isolated spiculæ could then be distinctly traced, beginning about the centre of the superciliary ridge, and invading portions of the parietal and temporal bones; while the little finger could be pressed into a vacuity, at the outer angle of the eye, corresponding to the transverse suture. By the twentieth day from the operation, the lines of separation between the bones had become obscure, the spiculæ were indistinct, and the whole enlargement was rapidly on the decline. The eye, now restored almost to its natural position in the orbit, had recovered its usefulness for distant objects, and the ear, which had been deaf, was now as acute as the other. Six months after the operation the patient was in the enjoyment of good health, and engaged in the labours of a blacksmith.[3]

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[1] Lectures on the Operative Surgery of the Eye, p. 158; London, 1823.

[2] Medico-Chirurgical Transactions; Vol. xxii. p. 124; London, 1839.

[3] American Journal of the Medical Sciences, January 1843, p. 173.

SECTION II. — ANEURISM BY ANASTOMOSIS IN THE ORBIT.

The disease so well described by Mr. John Bell under the name of *aneurism from anastomosis*, does not appear in every instance to arise from an original malformation, such as we observe in nævus maternus; but may begin in apparently healthy adults, from sudden and sometimes hidden causes. Neither is it confined to the skin or subcutaneous areolar tissue, but affects indiscriminately all parts of the body, and brings on complicated morbid phenomena even among the viscera. Numerous cases are now recorded in which aneurism by anastomosis has arisen within the orbit, characterised by pain in the eye and head, a peculiar sensation compared to a snap or crack, followed by a whizzing noise in the head, blindness, protrusion and pulsation of the eye, and pulsatory or aneurismal swellings between the eye and the orbit. The instances which have occurred of this disease in the orbit have been too few, to permit us to describe from actual observation its ultimate effects and termination; but reasoning from the history of aneurisms by anastomosis in other parts of the body, we cannot doubt that the progress of the disease would be equally rapid in this situation, the bleedings, if the complaint were neglected, alarming and dangerous, and the issue fatal. It is probable that orbital aneurism by anastomosis will, like the same disease in other parts of the body, be sometimes passive or venous, and in other cases active or arterial. It seems to be more frequently the latter.

I have already quoted (p. 161.) from Mr. Abernethy, a case of nævus maternus of the upper eyelid, in which the disease extended also into the orbit, and of which a cure was effected by the simple abstraction of heat, by means of folded linen, wet with a saturated solution of alum in rose water, and kept constantly applied over the tumour. This mode of treatment, however, and also that of pressure on the aneurism, are evidently inapplicable when this disease is situated deep within the orbit. To puncture an aneurism by anastomosis, and trust to the obliteration of the tumour by the pressure of the extravasated blood, a practice which in external nævi has succeeded, and which seems actually in one case of orbital aneurism by anastomosis to have been followed by a cure[1], would also be altogether unwarrantable. Neither can excision be had recourse to in such a case, unless we resolve at once to remove the whole contents of the orbit; and even were the patient ready to submit to this operation, could we with safety attempt it, knowing, as we do from the recorded histories of many aneurisms by anastomosis, the innumerable sources from which such tumours are supplied with blood, the great dilatation which the neighbouring blood-vessels commonly present, and the difficulty which has often been experienced in arresting the hæmorrhage attendant on attempts to extirpate tumours of this nature? Dr. Rognetta tells[2] us, he had twice seen Dupuytren extirpate the eye on account of aneurism by anastomosis in the orbit; but we cannot ground any conclusion on so vague a report.

The only other mode of treatment likely to impede the progress of an anastomotic aneurism within the orbit, is to diminish the quantity of blood and the force of the circulation through the tumour, by applying a ligature to the common carotid artery. It is probable, that the ultimate effect is not to obliterate the enlarged vessels, but that they remain pervious, only recovering their natural calibre. We owe the first proof of the efficacy of this plan, not only in preventing the increase, but even in effecting the cure of this disease, to Mr. Travers. His example has been followed by Mr. Dalrymple, of Norwich, who has published a second highly interesting example of the efficacy of the operation; while, still more recently, Mr. Wardrop has demonstrated (see p. 171) that similar good effects may be expected from tying the carotid, in cases of extensive nævus occupying the external parts of the face. The cases by Mr. Travers and Mr. Dalrymple are valuable, not only as proofs of the efficacy of the mode of treatment, but as illustrations of the origin, progress, and effects of the disease. I shall, therefore, quote them, almost without abridgment. At the same time, there is a suggestion made by Mr. Hodgson[3], which is worthy of notice, namely, that in similar cases it would be advisable to aid the process of cure, after the operation, by depletion and abstinence. In Mr. Travers' patient, the diminution of the tumour was very remarkable after violent discharges of blood from the uterus. A very spare diet, and the avoidance of all violent exercise, in conjunction with repeated blood-letting, have of themselves been sufficient to cure carotid aneurism.[4] The observance of a similar regimen must be highly proper, after the application of a ligature to the carotid, in any case of aneurism by anastomosis.

Case 231.—Frances Stoffell, aged 34, a healthy active woman, the mother of ive children, on the evening of the 28th of December, 1804, being some months advanced in pregnancy, felt a sudden snap on the left side of her forehead, attended with pain, and followed by a copious effusion of a limpid fluid into the cellular substance of the eyelids on the same side. For some days preceding, she had complained of a severe pain in the head, which was now increased to so great a degree, that for the space of a week she was unable to raise it from the pillow. The œdematous swelling surrounding the orbit was reduced by punctures; an ssue was set in the temple for a smart attack of ophthalmia which supervened, and leeches and cold washes were applied. She now first perceived a protrusion of the globe of the eye, with dimness of sight, and the appearance of a circumscribed tumour, elastic to the touch, and as large as a hazel-nut, upon the infraorbitrary ridge. Another softer and more diffused swelling arose at the same time above the tendon of the orbicularis palpebrarum. The lower tumour communicated both to the sight and the touch, the pulse of the larger arteries; the upper gave the sensation of a strong vibratory thrill. The swellings grew slowly, and the skin between the eyes, as well as that of the lower eyelid, became puffed and thickened. The globe of the eye was gradually forced upwards and outwards, and its motions considerably impeded. She had a constant noise in her head, which, to her sensation, exactly resembled the blowing of a pair of bellows. The pulsatory motion of the tumours was much increased by agitation of mind, or strong exercise of body, but the most distressing of her symptoms was a cold obtuse pain in the crown of the head, occasionally shooting across the forehead and temples. She was compelled to rest the left side of her head on her hand when in the recumbent posture, and found the beating and noise to increase sensibly when her head was low and unsupported.

Such was the substance of the patient's report, when Mr. Travers was requested to see her. He found the skin in the region of the orbits morbidly thick and wrinkled, the eyebrow of the diseased side pushed two or three lines above the level of the opposite one, and the hollow of the orbit lost from the elevation of the globe of the eye. The upper half of the inner canthus was filled by the thrilling tumour, which afforded a loose woolly sensation to the touch, was very compressible, and, when firmly pressed, was felt slightly to pulsate. The veins of the upper lid and on the sides of the nose were varicose, and the skin was much pursed over the lacrymal sac. The lower tumour, which projected above the infra-orbitary foramen, was of a conical shape, firm, but elastic to the touch. It could be emptied, or pressed back into the orbit, but the pulsation then became violent; and from the increased pressure of the globe upon the roof and side of the orbit, the pain was insupportable. Careful compression of the temporal, angular, and maxillary arteries, produced no effect on the aneurism. Upon applying the thumb to the trunk of the common carotid, Mr. T. found the pulsation to cease altogether, and the whiz of the little swelling to be rendered so exceedingly faint, that it was difficult to determine whether it continued or not. The recent increase of puffiness in the skin over the root of the nose, and below the inner angle of the opposite eye, had given alarm to the patient and her friends, who feared, not without some appearance of reason, a similar affection of the right orbit.

Mr. Travers felt persuaded that the disease could be no other than aneurism by anastomosis. It bore so strong a resemblance in its principal features to several of Mr. John Bell's cases, and in particular to that communicated[5] by Mr. Freer, of Birmingham, whose patient, refusing assistance, expired of hæmorrhage, that Mr. T. considered the sensible growth of the disease an argument of sufficient force to justify any rational attempt to repress it. From the character of similar cases, and the idea which he had formed of this, it was to be expected that although it had been slow in its formation, it would be rapid in its increase; and, unlike the aneurism of trunks, would resist control as it acquired size. He first tried pressure, but, although moderate, it could be borne only for a limited time, by reason of the pain attending the exasperated action of the arteries. Cold applications had been already made use of without advantage, but indeed the duration and aspect of the disease made this remedy appear trifling. Excision, the only method, of which in similar cases, experience had confirmed the success, was clearly impracticable without extirpation of the eye; and from the great displacement of the globe, and the obvious origin of the disease within the orbit, Mr. T. considered the result of such an operation to be most precarious. Satisfied of the increase of the disease, knowing from the happy precedent of Sir Astley Cooper's first case of carotid aneurism, the perfect practicability, and, under favourable circumstances, the moderate risk of placing a ligature on the carotid artery, and particularly reflecting that the obstruction of such a channel, must at all events, be followed by a sensible and permanent diminution of the impulse of blood destined to the disease, Mr. T. tied the carotid on the 23rd of May, 1809.

After exposing the artery, a curved eyed probe, carrying a stout round ligature, was passed beneath it, and upon compressing the vessel with the finger, as it lay over the probe, the pulsation of the lower tumour immediately ceased. The probe being cut away, the ligatures were drawn apart from each other, and tied. Before she quitted the table, the patient observed that the pain was benumbed, and that the noise in her head had entirely ceased. The small tumour over the angle of the eye was still thrilling, but very obscurely. The ligatures came away on the 21st and 22d days. Few symptoms of general irritation followed. By the 5th day, the pulse, which had risen to 130, fell to 84; her headache had subsided; and she felt comfortable in every respect.

The following are the principal changes which succeeded the operation. In the evening of the same day, the lower tumour had already acquired the thrilling motion of the upper. On the 3d day, the tingling or thrilling sensation was experienced in both tumours, upon light contact of the finger; if firmly compressed, a pulse was perceived in the lower. On the 5th day, the tumours were very considerably diminished, the eye less prominent; the globe of the eye communicated a slight pulsation; her sight was short, and objects appeared to her larger than natural, and misty. On the 21st day, she found no inconvenience from sitting up, and working all day, and was astonished to find that she could read small print, and do fine work with her right or sound eye, which she had been unable to do for years. By the end of the 5th week, she could perform all the duties of her situation as well as before the operation, and expressed herself well satisfied with the obvious diminution of the tumour, the decrease of the pulsation, and the total freedom she enjoyed from pain, which had distracted her for years. Four months after the operation, the tumours were evidently smaller, and their motion materially diminished; the eye was less projecting; the cold dull pain, formerly uninterrupted, was now but rarely felt; the artery of the left side was distinguished beating very feebly below the angle of the jaw, while the carotid of the opposite side contracted with more than ordinary force.

On the 28th of October, she miscarried at the period of about 10 weeks after conception. The hæmorrhage was so considerable as to induce syncope, and left her in a state of extreme debility. Next morning, the upper tumour was flattened, and the pulsation had altogether ceased. On the 30th, she felt pain in the affected side of the head, and was feverish. In the course of a few hours, the cellular substance of the orbit was filled with serous fluid, precisely as at the commencement of the disease. The pain was relieved, and the œdematous swelling, and heat of the surface, were reduced by a cold lotion. In November, the pain in her head had entirely subsided, but owing to her extreme debility from loss of blood, she was subject to occasional palpitation of the heart, and giddiness. The upper tumour, and the folds of the integuments between the eyebrows, had totally disappeared. The eye projected less; the lower tumour was inelastic, and had no preternatural pulsation. In May 1811, a knob, of the size of a large pea, over the inner angle of the eye, was the only vestige that remained of the disease.[6]

Nearly five years after the operation, Mr. Hodgson had an opportunity of examining the patient. She was then in perfect health, and the cure of the aneurism so complete, that it was impossible to discover that disease had existed in the orbit.[7]

Case 232.—On the 24th of November 1812, Dinah Field, aged 44 years, of a delicate and sickly habit of body, came to Mr. Dalrymple, of Norwich, with a complaint in the left eye. She said, that about five months before, being then pregnant of her sixth child, she was seized in the middle of the night with an intense pain in the left eyeball, accompanied by a whizzing noise in the head, which grievously distressed her. The attack was instantaneously sudden. Hearing a noise, as of the cracking of a whip, and feeling at the same moment an extraordinary kind of pain in the globe of the left eye, she awoke in great alarm, and leaped out of bed. About 10 or 12 hours afterwards, the eye became inflamed, and the eyelids so much swelled, as to project considerably beyond the level of the upper and lower orbitary ridge. She also felt acute pain over the whole of the left side of the head; while in the left eyebrow, and at the bottom of the orbit, her anguish was scarcely to be borne. In the succeeding night, the extreme violence of the pain abated, but the swelling of the eyelid seemed rather to increase; and she thought she felt as if the globe of the eye was forcibly drawn up towards her forehead.

No particular alteration took place in the next seven weeks, at the end of which time she was delivered. During her labour, which she said was very severe, there was projected between the eyelids a bright red tumour of an oblong form, which, for seven or eight days, gradually enlarged, until it occupied, in a vertical direction, almost the whole space between the superciliary ridge and the lower edge of the ala nasi, reaching horizontally from the external angle of the left eye, across the root of the nose, to nearly the internal canthus of the right eye. In the course of her confinement, this tumour was punctured, in several places, by a surgeon who then attended her. It bled freely, became smaller, and assumed a strikingly darker colour. A week afterwards, it was again punctured, and with similar results; and although the operation was repeated four other times, the latter incisions afforded no relief. About two months previously to the appearance of this swelling, the patient lost all power over the levator muscle of the upper eyelid; but if the swelling was depressed, and the lid raised, she could see as well as ever. She soon, however, became totally blind on this side.

Three or four months after Mr. D. first saw her, he found that her general health had sensibly declined, and that the local affection, now marked by very decided characters, was distinctly aneurismal. She had constant and acute pain, referred chiefly to the bottom of the orbit; but her severest suffering was occasioned by the increasing noise in her head, which she compared to the rippling of water, and which became absolutely insupportable, when, by any accident, her head fell below a certain level. The left eyeball was immoveable, and either enlarged, or thrust with so much force against the upper eyelid, as to cause this part to project in a convex form, considerably beyond the superciliary and infra-orbitary ridges. The eyebrow, also, of the affected side, rose somewhat above the level of the other. The external surface of the tumid eyelid was, for the most part, soft and elastic to the touch, but its cuticle was remarkably coarse, as was, indeed, the texture of the skin generally in the vicinity of the orbit. Deep-seated within the integuments of the eyelid, a little towards the inner canthus, there was a cluster of small tumours, of a firm and dense structure, causing great pain when compressed, and communicating to the finger a pulsatory thrill. Interposed between this cluster and the lower edge of the eyebrow, precisely in the course of the frontal branch of the ophthalmic artery, there was a hard tubercular substance, which rose somewhat higher above the general surface of the eyelid, and pulsated still more distinctly than the smaller swellings. The texture of this substance was particularly hard and compact, and the slightest pressure upon it occasioned intolerable pain. The lower eyelid was everted, and formed a bright and red convex tumour, following in its outline the direction of the inferior edge of the orbit, and reaching from the external commissure of the eyelids to a little way beyond the tendon of the orbicularis. At its upper part it was covered by an overlapping of the upper eyelid, which was paralytic, and entirely concealed the globe of the eye. The most depending part of this tumour reached to within a line of the infra-orbitary foramen. Like the tumours at the upper part of the orbit, this swelling communicated to the touch an aneurismal thrill. Its pulsation became evident to the sight whenever the force of the circulation was increased. In addition to these appearances, immediately above the nasal third of the superciliary ridge, the integuments were gently elevated into a soft ill-defined tumour, occupying very exactly the situation of certain branches of the frontal artery, and pulsating simultaneously with the artery at the wrist. A similar elevation of the skin was perceptible at the root of the nose, giving a faint tremulous motion to a finger placed upon it.

When the globe of the eye was uncovered, it appeared at first to be enlarged, but a closer inspection showed it to be forcibly thrust forwards, in a direction somewhat outwards and upwards. A multitude of enlarged vessels could be traced from the surface of the lower tumour to that portion of the conjunctiva which covers the sclerotica. The cornea retained its natural lustre and transparency, but there was a total loss of power in the iris, and the pupil, much dilated, was slightly irregular. Behind the lens a fawn-coloured appearance was observed, similar to that represented in the second plate of Mr. Saunders's posthumous work. The cutaneous veins were very full of blood, and gave to the skin of the left side of the face the complexion of a person strangled. When strong pressure was made upon the common carotid artery, the tremulous motions of the tumour, situated at the lower part of the orbit, ceased entirely, but the pulsations of the upper swellings continued in some degree. The force of the stroke was, indeed, much weakened, but no pressure which the patient was able to bear, could entirely suppress it.

At noon, on the 7th of April 1813, Mr. D. tied the common trunk of the lef carotid artery. The effects of the operation were immediate and decisive. A soon as the ligatures were tied, the pulsatory motions of the tumours on the forehead and cheek entirely ceased; but a slight thrilling was still perceptible in the tumid upper eyelid. The red swelling of the lower eyelid became paler, and its surface shrivelled. A few minutes after the patient was placed in bed, she wa quite free from pain, and the noise by which she had been so long tormented having also ceased, she declared that her head no longer felt *like her old head* At 5 P. M. there was no pulsation in any of the tumours. Next day the uppe eyelid, for the first time during several months, was moveable. The day after, the tumour over the inner part of the eyebrow was entirely gone; the swelling of the upper eyelid was much smaller, its texture much softer, and it was less painful when compressed; the globe of the eye also had considerably retired within its orbit. By the 15th of April, great changes had taken place in the tumours; the globe of the eye had completely retired within its orbit, the general prominence of the upper eyelid had sunk proportionably, and not the slightest pulsatory or thrilling motion was perceptible in any of the diseased parts. By the 17th of May, the tumours had all disappeared, and the patient's general health seemed re-established; yet the wound was not entirely closed, although the ligatures had come away, the upper on the 18th of April, and the lower on the 4th of May.

On the evening of the 3d of July, Mr. D. was called in great haste, in consequence of a bleeding which had taken place at the lower part of the wound. The hæmorrhage had ceased before he could reach the house. The colour of the blood was florid, and the quantity lost, 10 or 12 ounces. A similar discharge took place on the evening of the 9th of July, but, like the former, ceased spontaneously, and happily proved the last of a series of incidents, not unlikely to disappoint the hopes which the earlier circumstances of the case had inspired. From this period the course of events was prosperous; and on the 19th of July, which, reckoning from the morning of the operation, comprises a period of 103 days, the wound was firmly healed, and the patient's recovery secured. After a lapse of nearly two years, her cure appeared complete, with the exception of her sight, which seemed irrecoverably lost. With respect to the state of the local circulation, there was no pulsation to be felt in any of the branches of the left temporal and facial arteries; but, as in the case treated by Mr. Travers, the carotid might be distinguished beating very feebly below the angle of the jaw, while a very brisk action of the collateral branches lying near the surface, was visible in the vicinity and along the course of the cicatrice.[8]

In addition to the above cases of anastomotic aneurism in the orbit, several others have occurred, the narrations of which I must content myself with presenting to the reader in a condensed form.

Case 233. — A gentleman, aged 60, of a lively imagination, and greatly given to reading, who had suffered from bronchitis, became suddenly affected with exophthalmos of the right eye. When he consulted M. Jobert, the eye was projected straight forwards from the orbit, its motions were much impeded, and it was red, and intolerant of light; the eyelids could not cover the eyeball, there was constant lacrymation, and vision was nearly lost. On touching the parts, a tumour was detected, which had destroyed the superciliary arch to the extent of nearly ¾ inch. In the course of some months, the tumour rapidly increased, and projecting through the notch it had formed, it mounted over the frontal bone, towards the frontal protuberance. The diagnosis now became more distinct. That the disease was an aneurismal tumour was evident, from the pulsations with which it was affected, synchronous with those of the heart, the manifest movement of expansion which it showed, and the sort of susurrus which is remarked in varicose aneurisms.

No amelioration having been obtained from the employment of refrigerants and astringents, acupuncture having caused only an increase in the tumour, which had now attained the size of a small hen's egg, and such being the violence of the inflammation, and the degree of sensibility of the lids, that they could not move without insufferable pain, M. Jobert determined to tie the common carotid artery. Before doing so, to assure himself positively of the nature of the tumour, he plunged into it a very small trocar. Through the canula there came a continuous stream of arterial blood.

As soon as the artery was tied, the pulsation and the dreadful pain ceased. On the third day after, the eye could be moved in every direction, without uneasiness. By and by, it retreated into the orbit, and no trace could be distinguished of the tumour, except the loss of bony substance caused by its pulsations. When the patient coughed, the skin covering the deficient part of the bone was observed to be slightly raised, and immediately to fall down again. This looked as if a communication had been formed, in the course of the disease, with the frontal sinus. The arteries of the right side of the face scarcely presented the slightest pulsation; but on the left side, the arteries had acquired an evident degree of abnormal development. The left eye had also assumed a more than ordinary vivacity.[9]

Case 234. — A man, aged 30, having received, in January, 1839, a blow on the neck with a wooden plank, was, some weeks afterwards, attacked with pain in the right side of the head, and pulsation in the right orbit. Gradually the right eye seemed to enlarge, and its vision became confused. In July, when the patient came into the *Charité*, at Paris, there was evident exophthalmos; the cornea and humours were transparent; but the sight was much impaired; bosses of a somewhat livid hue, were distinguished through the skin of the upper eyelid, beneath the superciliary arch, and were the seat of pulsations, which could be seen and felt; by auscultation, a very distinct *bruit de forge* was heard in them; they subsided under pressure. The left orbit presented similar bosses and pulsations, but without exophthalmos or impaired vision.

The right common carotid was tied, and the symptoms of an erectile tumour immediately disappeared almost completely; but at the end of six weeks a degree of blowing sound could again be heard in the right orbit, and in three months there was a complete relapse.

A very remarkable circumstance in this case was, that from first to last, compression of the right carotid caused the *bruit* and pulsation of the left orbit to cease, while that of the left carotid completely stopped the movement of the tumour in the right orbit, although its pulsations yielded only partially to the compression of the right carotid. It seems to have puzzled M. Velpeau, under whose care the patient had been, to explain how the compression of the right carotid could affect both the tumours at the same time, and that of the left orbit in a manner more decided than that of the right.[10]

Case 235.—A remarkably fine girl, two months old, was brought to Mr. Walton, at the Central London Ophthalmic Hospital, in 1851, with a slight prominence of the right eye, discovered within a month after birth. There was no indication of any particular disease, and, after a few visits, the infant was not again brought till she was four months old. At that time, the eye was prominent, the lids swollen, the cheek puffy, and the conjunctiva thickly set with large bright-red vessels. Pressure on the eyeball lessened the protrusion for a few seconds, while crying rendered the eye more vascular, and caused great temporary protrusion. In a fortnight, there was increase of all the symptoms. Although Mr. Walton could not satisfy himself that there was any pulsation, several other surgeons declared they felt it; and the stethoscope, applied over the eye, detected an arterial *souffle*, not heard at the other orbit. All agreed that there was an aneurism by anastomosis. A cold lotion had been constantly applied for three weeks without effect. It was not considered prudent to apply pressure, from the pain which it seemed to produce.

When the child was four months and three weeks old, Mr. Walton tied the common carotid, Dr. Snow administering chloroform. The incision over the course of the artery was 1¾ inch long. The undeveloped state of the muscles of the neck, and the adhesion of their surfaces peculiar to infancy, rendered the use of the knife necessary for their separation. The ligature was passed, but not tied till the effect of the chloroform had subsided. This was observed as a precautionary measure, but there was not the slightest perceptible effect on the brain when the circulation was checked.

From the fourth day after the operation, pressure was applied by means of pads, retained by an elastic bandage round the head. The protrusion of the eyeball gradually diminished, and by the fifth day, the child could easily close the lids when asleep, which she could not do prior to the operation. A year afterwards, the eye had returned nearly to its natural position, only the slightest prominence remaining, and all the movements perfect. The little patient's health was excellent, there not having been the least ill result from the operation.[11]

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[1] See case by Schmidt, Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 263; Dresden, 1831.

[2] Revue Médicale; Tome iv. p. 400; Paris, 1832.

[3] Treatise on the Diseases of Arteries and Veins, p. 446; London, 1815.

[4] Mémoires de l'Académie Royale des Sciences pour 1765; Tome xxxvii. p. 758; Amsterdam, 1771.

[5] Bell's Principles of Surgery; Vol. iv. p. 262; Edinburgh, 1808.

[6] Medico-Chirurgical Transactions; Vol. ii. p. 1; London, 1813.

[7] Op. cit. p. 446.

[8] Medico-Chirurgical Transactions; Vol. vi. p. 111; London, 1815.

[9] Mémoirs de l'Académie Royale de Médecine; Tome ix. p. 57; Paris, 1841.

[10] Translation of this work into French, p. xx.; Paris, 1844.

[11] Walton's Operative Ophthalmic Surgery, p. 258; London, 1853.

CHAPTER XI.

DISEASES OF THE MUSCLES OF THE EYEBALL.

SECTION I.—INJURIES OF THE MUSCLES OF THE EYEBALL.

INJURIES of the muscles of the eyeball are extremely rare. In many cases of penetrating wound, the looseness of the orbital areolar tissue saves both the eyeball and its muscles. The recti are farther protected by their position behind the eyeball, while the branches of the third nerve, and the sixth nerve, by which they are supplied with nervous energy, enter their substance on their central surface, so as to be placed as much out of the way of injury as possible. Still it must occasionally happen (in such wounds, for example, as have been described in the 1st Section of Chapter I.) that the muscles shall sustain more or less extensive injury: and the consequence will be a certain degree of impediment in the motions of the eyeball.

The swelling and inflammation which almost immediately ensue, on penetrating wounds of the orbit, added to the depth of the injured parts, will in general render it impossible to determine the amount, or perhaps even the reality, of injury done in such cases to the muscles. Nor is this of much consequence in a practical point of view: rest, soothing applications, and antiphlogistic means, making up the treatment in all such cases.

Beer relates[1] the case of a medical student, in whom the abductor oculi appears to have been torn by a tobacco-pipe, thrust into the orbit.

Case 236.—I saw a man at the Glasgow Eye Infirmary, who, by falling on the edge of an iron pan, had divided the upper eyelid and the rectus internus. The eyeball was prominent and turned up, so that the pupil lay behind the edge of the upper lid. He could not turn the pupil towards the nose. There was a partial symblepharon between the upper lid and the eyeball, which I divided, after which the motions of the eye gradually improved.

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[1] Lehre von den Augenkrankheiten, Vol. i. p 146 ; Wien, 1813.

SECTION II.—WANT OF CORRESPONDENCE IN THE ACTION OF THE MUSCLES OF THE EYEBALLS.

§ 1. *Diplopia.*

From διπλόος, *double*, and ὄψις, *vision.*

In strabismus, though there is no palsy, there is an evident want of correspondence in the actions of the muscles of the eyeballs, and at the commencement of the complaint, there is double vision; but it would appear that double vision occasionally occurs also with a degree of distortion of the eyes, and impediment in their motion, so very slight, as scarcely to be observable. The double vision to which I now refer is binocular, and takes its origin, at least in some cases, from over-exertion of the eyes, or it may be of one eye to the exclusion of the other. It is necessary to be aware of the existence of cases of this kind, whether we attribute them to a loss of excitability, to spasm, or to any other condition of the muscular fibres produced by fatigue, lest we should confound them with those in which want of correspondence in the action of the muscles of the eyeball, and consequent double vision, are owing to paralysis.

Sir Everard Home, who first pointed out the practical importance of this distinction, has related two cases as illustrative of the symptoms and treatment of the diplopia in question. The cases are interesting in several respects, although it must be confessed that there is no very conclusive evidence to prove that the symptoms were dependent merely on an affection of the muscles, and not on the state of the encephalon.

Case 237. — A lieutenant-colonel of engineers, who was in perfect health, shooting moor-game upon his estate in Scotland, was very much surprised, towards the evening of a fatiguing day's sport, to find all at once that every thing appeared double; his gun, his horse, and the road, were all double. This appearance distressed him exceedingly, and he became alarmed lest he should not find his way home; in this, however, he succeeded, by giving the reins to his horse. After a night's rest, the double vision was much less; and in two or three days he went again to the moors, when his complaint returned in a more violent degree. He went to Edinburgh for the benefit of medical advice. The disease was referred to the eye itself, and treated accordingly; the head was shaved, blistered, and bled with leeches. He was put under a course of mercury, and kept upon a very spare diet. This plan was found to aggravate the symptoms; he, therefore, after giving it a sufficient trial, returned home in despair, and shut himself up in his own house. He gradually left off all medicine, and lived as usual. His sight was during the whole time perfectly clear, and near objects appeared single; but at three yards, they became double, and by increasing the distance, the two images separated farther from each other. When he looked at an object, it was perceived by a by-stander that the two eyes were not equally directed to it. The complaint was most violent in the morning, and became better after dinner, when he had drunk a few glasses of wine. It continued for nearly a twelvemonth, and gradually went off.

Case 238. — A house-painter, who had worked a good deal in white lead, was admitted a patient into St. George's Hospital, on account of fever attended with violent headache. Upon recovering from the fever, he was very much distressed at seeing every thing double: and as the fever was entirely gone, he was put under Sir Everard's care for this affection of his eyes. Upon inquiring into his complaints, Sir E. found them to correspond exactly with those of the former case, and therefore treated them as arising entirely from an affection of the muscles. He bound up one eye, and left the other open. The patient now saw objects single, and very distinctly, but looking at them gave him pain in the eye, and brought on headache. This led Sir E. to believe that he had erroneously tied up the sound eye; the bandage was therefore removed to the other, and that which had been bound up was left open. He now saw objects without pain or the smallest uneasiness. He was thus kept with one eye confined for a week, after which the bandage was laid aside; the disease proved to be entirely gone, nor did it return in the smallest degree while he remained in the hospital. Rest alone had been sufficient to allow the muscles to recover their strength, and thus to produce a cure.

Sir Everard concludes by observing, that when muscles are strained or over-fatigued, the first object of attention is to put them in an easy state, and confine them from motion, and that this practice is no less applicable to the muscles of the eye than to those of other parts.[1] Dr. Young[2] remarks on this, that when one eye is diseased, it is by no means sufficient to cover this eye only, in order to give rest to its muscles, since these muscles unavoidably follow the motions of the sound eye.

§ 2. *Monoblepsis.*

From *μόνος, single*, and *βλέψις, view.*

Case 239.—I was some time ago consulted by a gentleman, who, after spending a whole night in writing, was affected in the following manner: With either eye singly he saw quite well, but, owing to double vision, he could not use both eyes together, a symptom termed *monoblepsis.* Whenever he looked downwards with both eyes he lost sight entirely of the objects before him, although he saw well enough when he looked upwards. He complained of vertigo, but had no headache. The symptoms slowly subsided after rest, bloodletting, blistering, purgatives, and mercury. They did not recur, although after some time this patient had serious symptoms of disease within the head.

The following appears to be another case of the same sort:—

Case 240.—John Frost, carrier, aged 48, of stout make, and rather plethoric habit, on his return from Exeter market, was seized with such a dimness of sight, that he could not discern any object at the distance of a few yards, and was unable to keep on the road without holding by the end of his cart, though it was only about 3 o'clock, P. M., and the day quite fine and clear. Before reaching his home, however, he found that on closing or covering either eye, he could see sufficiently well with the other. Mr. Reed was called in next morning, and found that the patient could scarcely perceive even the lines of a book when both eyes were open, but that on closing either of them, he could read distinctly every word. These symptoms were accompanied with considerable pain in the forehead, and a full, quick, and rather hard pulse.

Mr. Reed took blood from his arm, purged him with calomel and colocynth pills, and applied a blister to the back of his neck, but without producing any alteration on his sight. The pain of his head was gone; but he was still under the necessity of wearing a bandage over one eye, without which he could not see even to walk. Errhines, and a little sulphuric ether applied to the eyes, always afforded him temporary relief. There was not the slightest irregularity in the appearance or motions of the pupils, the humours appeared perfectly transparent, and no traces of inflammation could be perceived.[3]

Should diplopia or monoblepsis not yield to rest and other remedies, palliation might be obtained by using prismatic lenses, such as have lately been recommended for strabismus. By shifting the place of the image on one or on both retinæ, objects might thereby be made to appear single.

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[1] Philosophical Transactions for 1797; Part I. p. 7.

[2] Introduction to Medical Literature, p. 99; London, 1823.

[3] Lancet for 1831-2; Vol. i. p. 167.

SECTION III.—PALSY OF THE MUSCLES OF THE EYEBALL.

Syn. Ophthalmoplegia.

I have already had occasion to refer (page 190) to the frequency of paralytic affections of the muscles supplied by the third nerve or motor oculi. We often have an opportunity of observing palsy of the rectus superior, inferior, and internus, accompanied by a similar affection of the levator palpebræ superioris, while the rectus externus retains its power, and turns the eyeball towards the temple. If with the finger we lift the upper lid in such a case, and tell the patient to look to the ground, we see that he attempts to do so, but is utterly unable to accomplish his intention. If we tell him to look upwards or inwards, he fails in both; and even when he endeavours to look straight forwards, the eye is scarcely, if at all, turned from its direction towards the temple. This state of immoveable distortion is styled *luscitas.* We observe also that the pupil is dilated, and does not contract when exposed to bright light; for the iris, which receives its stimulus for motion from the third nerve, is involved in the paralytic affection.

It some cases it happens, that after the paralytic state of the muscles supplied by the third nerve has continued for some time, the abductor also becomes palsied, so that the eye looks no longer towards the temple, but directly forwards, and can be turned in no other direction by any voluntary effort of the patient. We may conclude, in such circumstances, that the disease which originally caused pressure on the third nerve only, has extended so as to affect the sixth also.

When all motion of the eye is lost, from the palsied state of the recti, the eyeball is apt to project unnaturally from the orbit, a state which, as I formerly mentioned, is called *ophthalmoptosis,* and of which Sir Charles Bell records[1] an instance, combined with anæsthesia of the parts supplied by the fifth pair.

We meet, in some instances, with palsy of the abductor only, so that the eye is turned inwards, and cannot be moved towards the temple. In a case of this sort, which I saw at the Glasgow Eye Infirmary, and which seemed of an apoplectic nature, the patient was affected with circumorbital pain, vertigo, and double vision. Dr. Yelloly has recorded[2] a case of palsy of the left abductor, arising from the pressure of a tumour, lying on the pons Varolii, and extending to the left corpus pyramidale. The affection of the eye was attended with palsy of the right side of the body. The pupil retained its sensibility to light. A tumour in the fourth ventricle has also been known to produce palsy of the abductor.[3]

When the motions produced by the levator palpebræ, the rectus internus, superior, and inferior oculi, are partially or totally impeded, the movement inwards and upwards of the eyeball, which takes place when we wink, or close the eyes in sleep, and which is attributable to the action of the obliquus inferior, is evidently performed with difficulty, or is altogether lost. The eyeball is also observed to roll abnormally on its antero-posterior axis, an effect of the action of the superior oblique, uncontrolled by that of the inferior.

We find, in most cases of palsy of the muscles of the eyeball, that the fifth nerve and the portio dura continue to exercise their functions. The retina also generally retains its sentient power; but when the third is the nerve affected, vision is somewhat indistinct, owing to the dilated and fixed state of the pupil. In some cases there is complete amaurosis, with much pain in the head.

Headach, vertigo, and double-vision generally attend attacks of palsy of the muscles of the eyeball. The stomach and bowels are also often deranged.

Diplopia is often the chief, sometimes the only symptom of which the patient complains. By passing the finger from side to side, and upwards and downwards, before the patient, and desiring him to follow it with his eyes without moving his head, we detect which eye and which muscle is affected, even when the loss of power is very slight. In general, it is the adductor, or abductor of one or other eye, that is defective, so that the organ cannot be completely inverted or everted. Diplopia is experienced, in general, when the patient endeavours to look straight before him, and always when he tries to look in the direction opposite to the deviation of the affected eye. If the levator oculi, for instance, is palsied, diplopia occurs whenever the patient attempts to look upwards; and if we desire him to look steadily at some object placed directly before him, we observe the lower edge of the cornea of the affected eye to sink behind the lower eyelid.

In cases of palsy of the fourth nerve, or of the branch of the third going to the obliquus inferior, the rotatory motions of the eye will be interfered with, as may perhaps be detected by laying hold of the patient's head, and bending it from shoulder to shoulder.

Causes. As has been already (page 190) mentioned, palsy of the muscles of the eye sometimes arises from exposure to cold, while in other cases it is owing to vascular congestion, sudden effusion, morbid growths, or slow disorganisation within the cranium. These latter cases are sometimes consequent to blows or falls on the head. Palsy of the muscles of the eye is not unfrequently syphilitic. It is then attended, in general, by neuralgia of the fifth nerve, and by secondary syphilitic symptoms. In such cases, I have witnessed the remarkable combination of anæsthesia with neuralgia.

In some cerebral cases, the symptoms come on slowly and insidiously; in others suddenly, and to a great degree. At the commencement, as happens in other palsies, the symptoms sometimes come and go repeatedly.

Besides tumours pressing on the third and sixth pairs, effusions of coagulated lymph, surrounding the affected nerve, have been seen on dissection.[4]

Case 241. — A clergyman, officiating at a marriage, was detained for several hours, in an over-heated room, seated between an open door and window, with his left side to the door. Next morning, on awaking, he was surprised to find that he could not open his left eye. The eyeball was everted, and could neither be inverted, elevated, nor depressed. The pupil was widely dilated and fixed. The vision of the left eye singly was good; but, if both eyes were opened, double vision and vertigo immediately occurred.

Case 242. — I saw a gentleman, along with Dr. King, in whom, from palsy of the abductors, both eyes were inverted. This symptom had been preceded, six years before, by weakness of the lower extremities, and pain in the vertex. There was reason to think that his complaints were the consequence of a fall from a cart, on the back of his head, when a boy.

On dissection, the dura mater in the vicinity of the longitudinal sinus was found much thickened, strongly fibred, and presenting osseous spiculæ on both its surfaces. Between its inner surface and the tunica arachnoidea covering the brain, there was much Pacchionian matter. Where it covered the basilar fossa, the dura mater presented an atheromatous growth on both its surfaces, whereby it was greatly thickened. This degeneration reached as far down as the processus dentatus. The pituitary gland and cavernous sinuses appeared natural. The central parts of the brain were softened, especially the septum lucidum, and the surface of the corpora striata and thalami.

Treatment. I have little to add to what has been said under this head at page 191. The same morbific causes being in operation, they must be combated by the same remedies. In rheumatic and sudden cerebral cases, we are often successful by means of depletion[5], counter-irritation, and the use of sorbefacients; syphilitic cases yield to the steady employment of mercury and iodide of potassium; while in the slow cerebral cases we are too often but mere spectators of the loss of one function after another, till death closes the scene. The neuralgia, which is often an attendant on palsy of the muscles of the eye, is greatly relieved by small doses, taken internally, of tincture of aconite.

Electricity and Galvanism are of great service. In a case, arising from a fall from a horse, related by Dr. E. Gräfe[6], electro-puncture seemed useful. Magendie notices a case in his Lectures[7], in which a single application of electro-puncture produced a cure.

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[1] Nervous System of the Human Body; Appendix, p. cv; London, 1809.

[2] Medico-Chirurgical Transactions; Vol. i. p. 181; London, 1809.

[3] Ibid.; p. 216.

[4] Bell, Op. cit., pp xxxii, liii. See case of Agnes Robertson, in whom palsy of both nerves of the third pair arose from a fungous tumour of the dura mater; Medical Gazette, Vol. xxii. p. 781, London, 1838. See case by Struthers, of palsy of motor oculi, the nerve being found, on dissection, small, and of a yellowish-brown colour; Monthly Journal of Medical Science, July 1853, p. 1.

[5] See case in which palsy of the third nerve, preceded by severe pain in the head, was treated ineffectually by anti-neuralgic remedies, but cured by bleeding; Billing's First Principles of Medicine, p. 219; London, 1838.

[6] Gräfe und Walther's Journal der Chirurgie und Augenlienkunde; Vol. xii. p. 336; Berlin, 1828.

[7] Lancette Française, 6 Fev. 1836.

SECTION IV.—STRABISMUS, OR MOVEABLE DISTORTION OF THE EYEBALL.

From στρέφω, *I turn.* — *Syn.* Strabismus activus.

Fig. Dieffenbach, Tab. I. Boyer, Pl. I, II.

I. *Symptoms.* Strabismus is that disease, in which, although the patient means to look at the same object with both eyes, one of them, moving involuntarily, and independently of the motions of the other, turns away from its natural direction. If the sound, or better eye, be now closed, the one which squinted assumes generally the proper position, and so long as it is used alone, can be turned at the will of the patient in any direction he pleases. The instant, however, that the sound, or better eye, is again opened, the one affected with strabismus revolves inwards or outwards, and there it remains, not harmonising in the movements of its fellow, or if it does move along with the sound eye, yet never so as to permit the two axes to be pointed at the same object. Hence the patient sees double, especially in the commencement of the disease; but after a time, the double vision wears off, the impression on the squinting eye being neglected.

The eye is much more frequently distorted inwards than outwards, the adductor seeming to overpower the abductor. When the eye turns inwards, the disease is termed *strabismus convergens;* when it turns outwards, *divergens.* We also meet with strabismus upwards or downwards, or in any intermediate direction. In some individuals, we find the eyes squint alternately, or both together. In one case only have I seen strabismus directly upwards. The disease was congenital; and although the eye seemed natural when viewed by itself, it was considerably less than the other, and greatly deficient in sentient power. In a person recovering from amaurosis of the right eye, strabismus upwards and outwards came on in the left eye, without double vision or confusion of sight.

The vision of an eye that squints is almost always imperfect; and, of course, those who squint with both eyes see indistinctly and confusedly. Those who squint inwards with both are generally very short-sighted, or incompletely amaurotic.

II. *Proximate cause.* It is a common opinion that the most frequent cause of strabismus is weak-sightedness, imperfect vision from short-sightedness, or some congenital defect of the retina. The distorted eye, in almost every case, is very considerably inferior in power of sensation to the other. I use the words *very considerably,* because we meet with many individuals who have the eyes slightly unequal who do not squint; and with others who have laboured from birth under complete, or almost complete, amaurosis of one eye, and yet are quite free from strabismus. Buffon considered the inequality which produced strabismus as averaging 3-8ths. The impression, then, on the one eye, being considerably less perfect than that on the other, is very liable to be neglected altogether, and the defective eye, instead of being fixed on the object before it, is left to wander from the true axis of vision. There seems even to be an instinctive attempt, in some cases, still farther to distort the weak eye, and to turn it so far inward, and under the upper lid, that no impression can be received upon it, but that the sound eye only shall become the instrument of sensation.

That, in general, convergent strabismus depends on no change in the structure of the adductor, and divergent strabismus on no change of the abductor, is shown by the motions which the squinting eye performs along with its fellow, and still more strikingly by keeping the squinting eye open, and closing the other; for when this is done, we observe the squinting eye to assume a natural position, and move from side to side, always with considerable freedom, and often in a perfectly natural manner. The same experiment also disproves the notion, that in strabismus there is a paralytic state of the muscle, belonging to the side *from* which the eye is distorted; and equally sets aside, at least in all ordinary cases of the disease, the hypothesis that the most sensitive part of the retina of a squinting eye is not, as in the retina of a sound eye, the vertex, but some other part, in order to see with which, the patient distorts the eye till that part receives the image; for we find, in general, that the instant the opposite eye is shut, the squinting eye, under the guidance of its abductor and adductor, points its pupil, and consequently the vertex of its retina, towards the object. An exception to this rule is, when a speck of the cornea partially covers the pupil. If there is no such speck, and yet, on shutting the good eye, the squinting one is not turned directly towards objects, but remains distorted, then, but not till then, there will be reason to suspect that the vertex of the retina of that eye is less sensitive than some part to the side of the vertex. The cause of ordinary strabismus, then, must lie deeper than the muscles of the eye, and deeper even than the retina; namely, in the brain and nerves, the organs which govern the associated actions of the muscles of both eyes. It is, therefore, not to be wondered at, that when the thought first occurred to the minds of medical men[1], that the division of the adductor might perhaps prove useful in convergent strabismus, the plan of thus remedying a disordered exercise of a nervous function, by dividing one of the muscles, which, in consequence of that disorder, acted abnormally, should have been conceived with distrust, and allowed to fall aside.

III. *Pathological Anatomy.* Dissection has thrown but little light on the cause of strabismus. In dissecting the muscles of a squinting eye, there is, in general, nothing unnatural observed in them or their attachments.[2]

A young man under the care of M. Guersent, squinted, and had a speck on the cornea of the squinting eye, when he was seized with typhus fever, of which he died. Dr. Cavarra[3] dissected the muscles of his eye with great care, their vessels and their nerves, but found no appearance of disease about any of them. The brain seemed healthy, except only that the lateral-external part of the crus cerebelli, on the same side as the strabismus, presented a loss of substance for some lines, exposing the medullary substance.[4]

In a case of convergent strabismus dissected by Mr. Partridge, the external rectus was elongated, and much attenuated; the internal was short, bulky, and had a much thickened tendon. Except in the levator palpebræ, the muscular fibrils appeared, under the microscope, to be made up of pure granular matter, enclosed in the usual sarcolemmar sheaths; only here and there a few striped fibres were observable, and in the external rectus they were scarcely to be detected. The sixth nerve, just after its entrance into the orbit, had a light grey, semi-transparent look, and in its trunk was an oval enlargement, about the size of a pin's head, quite firm to the touch.[5]

IV. *Varieties of Strabismus.* The muscles and motor nerves of the eyes being perfectly free from disease, and the person looking straight before him towards some distant object, the pupil of each eye is placed nearly midway between the nasal and temporal sides of the orbit, and the axes of the eye are accounted parallel, although they are not strictly so. The distance between the pupils, or between the inner margins of the corneæ, being measured, if the person now turns his eyes to either side, and towards objects placed at the same distance as the object which he looked at directly, the one eye, by the action of its abductor, becomes everted, and the other, by the action of its adductor, becomes inverted; but the pupils maintain the same relative distance as at first, and the axes of the eyes continue parallel.

Mutual parallelism, then, is the normal condition of the eyes when directed to distant objects, and as this condition continues even when one eye is blind, it must be independent of vision, and arise from the constitution of the motor nerves.

In strabismus, when the person looks, with both eyes open, at a distant object placed straight before him, one of his pupils is placed in its normal situation, but the other is turned towards the nose or towards the temple. When one or other of the pupils is thus distorted, the axes of the eyes are no longer parallel, but, if continued, would meet and cross each other, *before* the eyes in the convergent variety, and *behind* them in the divergent. This is the case, whether the person looks forward or to either side; for if we measure the distance between the inner margins of the corneæ whilst the patient is looking at a remote object straight before him, we find it less in convergent, and greater in divergent strabismus than it ought to be; and let the eyes be turned as they may, the same faulty distance continues, and the same want of parallelism consequently continues also.

There is, then, in strabismus a new and abnormal association of the eyes; a mutual convergence in the one variety, and a mutual divergence in the other. Like parallelism, this new association is shared by both eyes; like it, is unaffected by the state of vision; and like it, continues, whatever be the direction of the object looked at. The one eye may be straight or central, as when the patient looks at an object directly before him, while the other eye is inverted or everted: the one eye may be everted, and the other inverted, as in looking to a side; by moving the object to the temporal side of the distorted eye in convergent strabismus, or to its nasal side in divergent strabismus, both eyes will become equally inverted in the one case, and equally everted in the other; yet the faulty distance between the pupils will continue as before, and consequently, the want of parallelism, and the mutual convergence or divergence, as the case may be, will be unchanged.

In treating of strabismus, we require to distinguish *inversion* and *eversion* from *mutual convergence* and *mutual divergence*. In many cases, both of convergent and divergent strabismus, we observe that when the patient looks fully to one side, the one eye is inverted, and the other everted. Want of parallelism in the axes of the eyes, and not mere inversion or eversion, is the essential characteristic of strabismus[6]; and the whole object of the treatment in this disease is, not so much to remove the mere inversion or eversion of the eyes, still less to destroy their power of inversion or eversion, as to restore them to parallelism in all their movements.

When parallelism is lost, it will always be observed, as Mr. Elliot[7] of Carlisle has pointed out, that on desiring the patient to look straight before him, one eye is directed in the natural way, straight upon the object, while the other is inverted or everted, according to the kind of strabismus. The position of the one eye is regulated by the object looked at, and is subservient to its exercise of vision; the position of the other is regulated by the association of motion between the eyes, and does not depend on vision any more than does the position of a blind eye in a person whose eyes are parallel. If the eyes in any case of strabismus are unequal in visual power, the more clear-sighted is always used by the patient, in preference to the other, when both eyes are open. The worse eye is distorted, because, if used at all, it would supplant the better eye. The patient has no power to substitute the vision of the worse eye for that of the better, when both eyes are open and neither is shaded; and therefore, under such circumstances, the former is always distorted. If the eyes are equal in visual power, they will be distorted alternately, though the mutual convergence or divergence, or, in other words, the faulty distance between the corneæ, will always be the same. In strabismus characterised by mutual convergence, then, when the patient looks forward, one eye must be inverted; and in strabismus characterised by mutual divergence, one eye must be everted, as both eyes cannot be directed straight upon an object unless their axes are parallel. The relative powers of vision decide as to which organ will be employed, while the other must obey the abnormal association of motion.

Authors speak of *single* and *double* strabismus. To constitute a case of *single* strabismus, the distortion, whether convergent or divergent, should always appear in the same eye, and not affect the good eye, even on shading it with the hand while the squinting eye is directed straight towards objects. Such a case rarely, if ever, occurs, unless after operation.

It is a common notion, that there is a *double* convergent strabismus, in which both eyes are inverted at the same moment, and a *double* divergent strabismus, in which both are simultaneously everted. A patient, in a fit of musing, or regarding things carelessly, or employing his eyes with rapid alternation, may seem to squint with both eyes; but the moment that his attention is directed to a particular object at a considerable distance, the one eye becomes straight, and the other remains distorted. Only when the object is very near are both eyes inverted together, in convergent strabismus. Both eyes might also be inverted, were the vertices of both retinæ insensible, or if there happened to be insensibility of the vertex of the retina of the better-sighted eye, with mutual convergence.

Not unfrequently we meet with cases in which, both eyes being uncovered, the distortion seizes sometimes the one eye, and at other times the other, the patient using only one eye at a time. Such cases are designated by the name of *alternating* strabismus. The patient possesses the power of directing the eyes alternately upon the object looked at, when both eyes are open, and neither is shaded. Parallelism is equally wanting in these cases as in the others; the eyes are still mutually convergent or mutually divergent, according to the direction of the distortion.

The most common cases of strabismus are, with both eyes open, *non-alternating*; although the distortion can be made to alternate, by shading the clear-sighted eye and calling the opposite one into action. Whether the disease is convergent or divergent, when both eyes are open the same eye is always used for the purposes of vision, and the distortion always appears in the other; and hence, one eye only seems to be affected, although both are involved. With both eyes open, and neither of them shaded, the patient is able to direct only one eye, and always the same one, towards the object.

We are able readily to detect non-alternating, as well as alternating strabismus, by desiring the patient to look steadily, with either of his eyes, at any object straight before him, while with our hand we hide the object from his other eye, but keep the hand sufficiently raised towards the temple to allow us to watch the movements of the eye which is thus shaded. Whether the strabismus is alternating or non-alternating, the shaded eye is distorted.[8] If, in such a case, we close both eyes, and then suddenly raise the upper eyelid of either while the other remains closed, the one which is opened is seen to be distorted. If both eyes are suddenly opened, the pupil of the worse eye is discovered to be more distorted than that of the better eye.[9]

If, on trying these experiments, the eye which is shaded, or either of them on being opened suddenly, showed no obliquity, we would pronounce that eye to be sound, and assure the patient that the distortion of its fellow might be cured without operation, simply by exercising the squinting eye, with the other bandaged.

If the shading of either eye makes the other straight, and throws the one which is shaded into distortion, the case is plainly one in which both eyes are implicated. On again exposing both eyes, the distortion settles as before, in the eye whose vision is the more defective, which should therefore be subjected to a division of its adductor or abductor, according as the case is convergent or divergent. Out of a hundred cases of strabismus, five probably are divergent, and the rest convergent. Distortion directly upwards or downwards is very rare. Not unfrequently, in convergent strabismus, the eye is turned upwards and inwards, or downwards and inwards; which might lead us to suppose that, besides the adductor, the inner fibres of the levator or depressor would require to be divided. Experience shows, however, that dividing the adductor is generally sufficient.

V. *Degrees of Distortion and Impeded Mobility of the Eyes.* We meet with cases in which the distortion is slight; others, in which, though greater, it is still moderate, none of the cornea being covered; while in a third set the cornea is almost completely hid from view, so that the distortion is extreme. Similar gradations occur in respect to the mobility of the distorted eye, when the opposite eye is closed; for in some cases the power of turning the eye is perfect; in others, the eye can be brought to the central position, but no farther; while, in a third set, the eye cannot reach the central position, and presents but a very limited power of motion.

The degree of mobility, much more than that of distortion, affects the prognosis; for a great degree of distortion, if the mobility is free, may often be remedied by a simple and easy operation, while a case in which the motion is much impeded, although the faulty direction is trifling, generally requires more trouble to free it from its distorted state, and is less apt to be perfectly cured. The power of abduction being free, in convergent strabismus, indicates that the inversion is principally caused by the adductor, and is not much owing to the action of the levator and depressor.

Mr. Elliot's observations show, that, whether the strabismus is alternating or non-alternating, if the distortion is slight, an operation on one eye will generally be sufficient to restore parallelism; but that if it is great, both eyes will often require to be operated on.

In alternating cases, if the distortion is moderate, and the power of inverting and everting each eye singly is free, the division of the adductor or the abductor of one of them, according as the strabismus is convergent or divergent, is, in general, sufficient. If the distortion is extreme, and the movements imperfect, the operation will require to be performed on both eyes.

With respect to the prognosis in cases where there is no alternation, but where the same eye always squints, and the other is straight, as the patient looks directly before him, with both eyes open, the following facts are established: —

If the bad eye is but slightly distorted, and its power of motion, when the better eye is closed, is free, the cure which is obtained by dividing the adductor or the abductor of the bad eye, according as the case is convergent or divergent, is so nearly perfect, that it is unnecessary to operate on the better eye. But where the distortion is greater, and the power of motion is less, either the restoration of the bad eye to its natural position is prevented after the operation, or the distortion shifts to the better eye, in consequence of the abnormal association of the nerves of the two sides. This association is broken, and parallelism restored, by operating on both eyes.

After the first eye is cut, Mr. Elliot, by the following simple rule, determines whether the second requires to be operated on or not: — If any distortion be apparent in either eye, on looking straight forward immediately after the first operation, the second eye should be cut.

Care must of course be taken, not to mistake luscitas for strabismus; lest we fall into the error of dividing the adductor or abductor for a distortion caused by *palsy* of the antagonist muscle.

VI. *Remote and exciting Causes.* Strabismus is connected with many remote or exciting causes.

1. Although rarely congenital, squinting is hereditary; not unfrequently three or four children in a family taking it from the father or mother. Dr. Parry states[10], that if the father or mother of a family squints, the majority of the children have the same defect. He asserts, however, that this does not commonly arise from hereditary defect; for that if taken while infants from their parents, they do not acquire the habit. They squint, he thinks, merely from imitation. This may fairly be doubted. I think it more probable that, in such instances, if one eye is not imperfect in sentient power, one of the muscular nerves defective, or one of the recti weak, from birth, there exists at least a predisposition to the disease in the organization of some portion of the optic apparatus. It is a familiar observation, that children first show a disposition to squint at nearly the same age as the parents, or the uncle or aunt, had done, and this several years after birth. This happens, as Dr. John Clarke mentions[11], without any symptoms of oppressed brain having occurred.

2. Strabismus is supposed to take its origin, in many cases, from improper education of the eyes in young children. Their eyes must be trained to regular and harmonious movement, by exposing them equally to the light, and presenting to their view objects likely to fix their attention, neither too near nor at too great a distance, and much less in any unnatural direction. The bad custom of laying a child in such a position in its cradle that it sees the light, or any other remarkable object, chiefly with one, and always the same eye, may give rise to a continued action of certain muscles, and corresponding inaction of their antagonists. Holding the child's toy near its eyes, or amusing it by suddenly presenting some favourite object close to its face, may excite squinting. Strabismus divergens is attributed to the improper

practice of exciting a child to look at the same time, at two objects of which it is fond, but which are distant from one another.

3. Children occasionally become squinters from the trick of looking at the point of their nose, or if there be any wart or spot upon it, by attempting frequently to inspect this deformity. They thus distort the eyes, and fall into the habit of doing so unconsciously.

4. Imitation has been accused as a cause of squinting.[12] The child is supposed to catch the disease from its nurse.

5. Squinting frequently follows injuries, inflammation, and other affections, which render the natural movements of the eye painful. Ophthalmia tarsi, or even a stye, has been observed to produce squinting in this way. Ulcer of the cornea, followed by a speck, is a frequent cause. We are in the habit of attributing the squint to the speck; but I believe the ulcer to be generally the true cause. A child finds, that by a particular effort of the muscles, he can so turn the eye as to ease the pain attending the friction of the ulcer in the natural movements of the organ. This effort is attended by a squint, and by frequently repeating this effort, or almost constantly employing it for a time, a habitual strabismus is formed, which is often not detected till the ulcer is healed.

6. It is not at all unlikely, however, that a speck on the cornea may cause squinting. By turning the eye out of the natural axis of vision, the patient is able to see better past the speck. He is very apt so to turn the eye with the speck, if it happens to be the better eye of the two. In this way strabismus is not an unfrequent consequence of scrofulous ophthalmia.

7. Darwin was of opinion that the most general cause of squinting in children was the custom of covering a weak eye, which had become diseased by an accidental cause, before the habit of observing objects with both eyes was perfectly established. In all cases of ophthalmia both eyes should be shaded, and a single shade never permitted.

8. Strabismus is sometimes attributed to a spasmodic effection of one of the recti, and this is supposed to arise from various causes; as, terror from a puncture of the eye, &c. I was consulted by the friends of a little boy, who became affected with strabismus immediately after squirting the oily juice of a piece of orange skin into his eye, which produced a great degree of pain.

9. Painful affections of the mind sometimes give rise to squinting. A fit of passion is a common cause of squinting in children. It probably acts by inducing a degree of apoplexy. Both eyes are often affected, but the one more than the other. A child has been known to squint for months after a violent fit of crying. A little boy awoke in the middle of the night on board a steam-boat; he was greatly alarmed, and soon after was observed to squint. In another boy, this affection appeared in consequence of forcibly bathing him in the sea, which was persevered in for some time, notwithstanding violent screams, and other expressions of terror.

10. Strabismus is induced by various diseases of the brain, as irritation from costiveness, worms, teething, and the like; inflammation, ramollissement, apoplexy, epilepsy, hydrocephalus, scrofulous tubercles, &c.

Sometimes squinting is the earliest sign of hydrocephalus. In this case, it is speedily followed by convulsions.

Scrofulous tubercles in the brain often give rise to squinting as their first symptom. On careful examination, other signs of cerebral disease will be discovered; such as dropping of one or both upper eyelids, heaviness of the head, the head drawn back or to one side; partial loss of power in the limbs, difficulty in swallowing, difficulty in evacuating the fæces or urine, which are sometimes retained for days, and similar symptoms. By and by, the patient is perhaps affected with inability to close one or both eyes, one cheek is more flushed than the other, a peculiar stiffness is observed in the limbs formerly in a state approaching to palsy, there is difficult breathing, and convulsions set in, followed by coma and death. On dissection tubercles are found in the cerebellum, or in the neighbourhood of the pons Varolii, which have pressed upon the nerves, and induced an accumulation of water in the ventricles.

In a valuable analysis of 200 cases of strabismus, Dr. Radclyffe Hall[13] enumerates the following causes as those assigned by the patients themselves or their parents, without vouching for the correctness of the testimony, except where physical conditions yet remained to substantiate the opinions given:—

1. Convulsions during infancy, in 9 cases; falls on the head, in 7; severe concussion of the brain, in 1; difficult dentition, in 3; hooping-cough, in 2; intestinal worms, in 3; epilepsy, in 2; a severe thrashing, in 1; excessive fright, in 1.

2. Ophthalmia which had left no opacities, in 14; opacity of the cornea, in 5; opacity said to have existed formerly, in 1; wound of the cornea, by a stocking needle, in 2; by a fork, in 1; by a thorn, in 2; blow on the eye, in 5; burn of the eye from a piece of metal flying into it, in 1; a habit of looking at the sun, in 2; crush from acart-wheel going over the orbit, in 2; amaurosis, in 2; imperfect cataract, in 3; exposure during infancy to the light and heat of a blazing fire, in 3.

3. Imitation of a squinting person, in 39; watching the motion of a shuttle, in 1; voluntarily trying to squint, in 1; a habit of looking at a scar on the eyebrow, in 1; at a scar on the nose, in 2; at a scar on the cheek, in 2; at a small encysted tumour at the inner canthus, in 1; at a small nævus in the same situation, in 1; at a mole on the nose, in 1; a habit of sucking the thumb, and looking steadfastly at it, at the same time, in 1; holding the head sideways whilst knitting, in 3.

4. Measles, in 4; small-pox, in 6.

5. Severe burns of the abdomen, in 2.

In four instances, Dr. Hall was assured that the strabismus was congenital. In the remaining cases of the 200, no causes were assigned.

It appears probable, that in the first and fifth classes, an unequal communication of nervous energy to the muscles of the eye, in consequence of disease in the brain or its vessels, is the origin of the distortion. In the second and fourth classes, the distortion is probably at first an effort to free the eye from pain, or the result of such disuse of the eye and of its natural movements, as must often arise from wearing a shade over one eye. In the third class, strabismus arises from habit.

In the early stage of every strabismus, double vision must exist. An effort to get free from the confusion, attending diplopia, probably increases the distortion. As the disease becomes confirmed, the vertex of the retina of the squinting eye, being no longer turned towards objects, and therefore receiving only the light which falls upon it obliquely, seems to lose a great share of its sensibility, merely from disuse.

In all the five classes, strabismus, having once become habitual, so that one of the muscles of the eye is almost always in a state of active contraction, while its antagonist is left in a state of relaxation, the former not only obtains an increase of power at the expense of the latter, but there is reason to think that interstitial changes sometimes take place, by which the active muscle becomes hypertrophied, and the inactive one wasted. The process by which such a condition of the parts can be brought about must be slow, and can occur only where the strabismus has continued for years, with little or no intermission. Were such a state of the muscles known to exist in any case, it would lead to an unfavourable prognosis in regard to the result of the operation.

VII. *Treatment without Surgical Operation.* 1. As strabismus often arises in children from abdominal irritation, communicated perhaps through the great sympathetic, to the orbital nerves, we ought in recent cases to try the effect of an active purge or two, and then follow this up by mild aperients, and a carefully regulated diet. Squinting children are generally weakly and often scrofulous, so that a course of tonic medicine might be useful.

2. Strabismus is frequently observed in children to be connected with a careless employment of the eyes, which is instantly corrected by exciting their attention. In this case, Buffon's advice may be of advantage: — Make the child look often in the glass: he will see the squint, and correct it. This is a useful means of cure, when volition is sufficient, as it sometimes is, to prevent the squint. In other cases, the squint is never observed, except when the child is in bad temper. The occasions of this are to be avoided.

3. When only one eye squints, and when the defect in the sight of that eye is not very great, much may be done, by strengthening its muscles, to cure the strabismus. The strengthening of the muscles is effected chiefly by excluding the light from the sound eye, and thus obliging the patient to exercise naturally the eye which squints. The light is best excluded by means of a small concave shade, covered with black silk, fitting exactly round the orbit, allowing free motion of the eye and eyelids, and fixed by a ribbon tied about the head. Whenever the sound eye is blindfolded, the weak eye recovers its natural position in the orbit, and its natural motions. The patient finds that the sight gradually improves by use; and though the strabismus does return, on again exposing the sound eye, especially after sleep, from the muscles having been inactive, yet it is not to the same extent, and day after day becomes less, if the plan of cure is continued.

The patient need not keep the sound eye covered during the whole day. At first the shade may be worn for half an hour or an hour at a time, and then for longer periods. During the blindfolding of the sound eye, the weak one is to be exercised both on distant and near objects, but especially on the former. If the patient be a child, he must be encouraged to exercise the weak eye in playing at ball or shuttlecock, viewing extensive prospects in the country, reading books printed in a large type, looking at prints, &c. Many authorities might be produced in favour of the efficacy of this mode of cure. Professor Roux cured himself in this way of a squint, which he had had for thirty-five years.[14] Beer[15] tells us, that by binding up the sound eye every day even for a couple of hours only, he had in most cases been successful.

It is worthy of remark, however, that this plan of curing strabismus is often attended by a diminished power both of motion and of vision in the sound eye; and that it has sometimes happened, that the squinting eye being cured by perseverance in this method, the sound eye has become distorted. If both eyes squint from the first, they must be blindfolded alternately, each for several days at a time.

Exercise of the squinting eye is promoted by the use of goggles of various sorts. The best which I have seen, were obligingly sent me by Mr. Bullmore of Truro. They are formed of two short oval tubes, which are sewed, as usual, into a piece of leather, and this tied round the head. The front of the tube which is applied before the good eye, is furnished with a central aperture of about a line in diameter. Into the front of the tube, applied before the squinting eye, is inserted a slide, capable of being so moved, that the aperture in it is brought nearer and nearer, from time to time, to the central position, as the squinting eye improves in its power of direction. The slide can be reversed, so as to adapt the goggles either to a convergent or to a divergent squint.[16]

Another method of exercising the weak eye is that recommended by Jurin.[17] Having placed the patient before us, we bid him close the good eye, and look at us with the one which squints. When we find the axis of this eye fixed directly upon us, we bid him endeavour to keep it in that situation, and open his good eye. Immediately the squinting eye turns away from us towards the nose, and the axis of the other is pointed at us. But with patience and repeated trials, he will by degrees be able to keep the squinting eye fixed upon us, for some little time at least after the other is opened. When we have brought him to continue the axes of both eyes fixed upon us, as we stand directly before him, it will be time to change his position, and to set him first a little to one side of us and then to the other, and so to practise the same thing. When, in all these situations, he can perfectly and readily turn the axes of both eyes towards us, the cure is effected. An adult may practise all this in a mirror, without any director, though not so easily as with one.

4. As there is an inequality in the sensations of the sound and of the weak eye, it has been suggested that we should endeavour to put them more upon a par, and that this of itself would tend to

correct the distortion. Buffon recommended, therefore, that the patient should wear a pair of spectacles with a plane glass opposite to the bad eye, and a convex glass opposite to the good eye. In this way the vision of the good eye would be rendered less distinct, and consequently it would be less in a state to act independently of the other.[18] As the weak eye is often short-sighted, the same advantage might perhaps be derived from placing a plane glass before the good eye, and a concave glass before the distorted one.

5. Dr. Kurke has recently recommended a prismatic lens to be placed before the squinting eye, with its basis or thicker edge on that side towards which the eye should be directed. By means of the prismatic lens, the image on the retina of the squinting eye is shifted so as to produce diplopia, to avoid which the patient is led to bring the relaxed muscle into play, and by persevering in the effort thus to free himself of the diplopia, the strabismus, in slight cases, is ultimately cured.[19]

6. Dr. Cavarra recommends electricity. He uses electro-puncture of the supra-orbitary and infra-orbitary nerves. With platina needles the two branches are penetrated where they come out on the face, and then the ends of the needles are connected for an instant with the poles of a Galvanic pile. This being repeated six or seven times, the needles are withdrawn. This operation is repeated twice or thrice a-week. It is most successful in children, and is stated by Dr. C. to be neither painful nor dangerous.[20]

7. The treatment of strabismus will, of course, be varied, according as the cause is more or less intimately connected with the muscles of the eyeball. A mere bad habit in the use of these muscles will probably be completely overcome by exercising the weak eye, according to the methods already described, and thereby strengthening the patient's volition over its motions. In cases of speck of the cornea, myopia, partial amaurosis, disease within the cranium, nervous irritation communicated from distant organs, means suited to these different causes must be adopted. In some cases, a certain degree of success, obtained by one plan, must be followed up by another of a different kind. Thus Pellier relates[21] the case of a girl whose squint was occasioned by a speck on the cornea consequent to small-pox. By the use of stimulating drops, he removed the speck, but the strabismus remained the same. He then began a careful system of exercise, with the sound eye covered, and by this means effected a cure.

8. In cases of strabismus convergens, affecting both eyes, it is recommended that a pair of blinders, projecting in front of the temples, should be tried during at least a portion of every day, with the view of attracting the eyes outwards; and that when the blinders are laid aside, a broad green shade should be worn. In most cases of squinting, a shade for both eyes is useful, or the employment of glasses of a pretty deep neutral tint.

Darwin[22] employed a different plan, and with considerable success, in the following case, which appears to have partaken of the nature of this strabismus: —

Case 243. — The patient was a child five years of age, exceedingly tractable and sensible. He viewed every object which was presented to him with but one eye at a time. If the object was presented on his right side, he viewed it with his left eye, and *vice versâ.* He turned the pupil of that eye which was on the same side with the object, in such a direction that the image of the object, might fall on that part of the bottom of the eye where the optic nerve enters it. When an object was held directly before him, he turned his head a little to one side, and observed it with but one eye, *viz.* with that most distant from the object, turning away the other in the manner above described; and when he became tired with observing it with that eye, he turned his head the contrary way, and observed it with the other eye alone, with equal facility; but never turned the axes of both eyes on it at the same time. He saw and named letters, with equal ease, and at equal distances, with the one eye as with the other. There was no perceptible difference in the diameters of the irides, nor in their contractility after having covered his eyes from the light.

From these circumstances, Darwin was led at first to conclude that there was no defect in either eye[23]; but that the disease was simply a depraved habit of moving the eyes, probably occasioned by the form of a cap or head-dress, which might have been too prominent on the sides of his face, like bluffs used on coach-horses, and might, in early infancy, have made it more convenient for the child to view objects placed obliquely with the opposite eye, till by habit the adductores were become stronger, and more ready for motion than their antagonists.

Darwin recommended a paper gnomon to be made, and fixed to a cap. When this artificial nose was placed over his real nose, so as to project an inch between his eyes, the child, rather than turn his head so far to look at oblique objects, immediately began to view them with that eye which was next to them. This plan of cure was not persisted in; so that, six years after, Darwin found all the circumstances of this child's mode of vision exactly as they had been, except that they seemed established by longer habit, so that he could not bend the axes of both his eyes, on the same object, not even for a moment.

By Darwin's advice, a gnomon of thin brass was made to stand over his nose, with a half circle of the same metal to go round his temples. These were covered with black silk, and by means of a buckle behind his head, and a cross-piece over the vertex, this gnomon was worn without inconvenience, and projected before his nose about two inches and a half. By the intervention of this instrument, he soon found it more convenient to view oblique objects with the eye next to them, instead of the eye opposite to them. After his habit was weakened by a week's use of the gnomon, two bits of wood, about the size of a goose-quill, blackened all but a quarter of an inch at their summits, were frequently presented for him to look at, one being held on one side of the extremity of the gnomon, and the other on the other side. As he viewed these, they were gradually brought forward beyond the gnomon, and then one was concealed behind the other. By this means, in another week, he could bend both his eyes on the same object for half a minute together. By the practice of this exercise, before a glass, almost every hour in the day, he became in another week able to read for a minute together, with his eyes both directed on the same objects. By perseverance in the use of the artificial nose, he acquired more and more the voluntary power of directing both eyes to the same object, particularly if the object was not more than four or five feet from him, so that Darwin anticipated a complete cure.

9. In strabismus divergens, affecting both eyes, alternate blindfolding of the eyes is as likely to be useful as in the strabismus convergens. It has also been advised to apply a piece of black plaister on the point of the nose, which may attract the patient's view, and correct the divergence.

Weller recommends[24] a short funnel, made of pasteboard, with an oval base, to be so applied as to include both eyes, and having, at its apex, which rests above the point of the nose, an opening about an inch in diameter. Through this instrument, fixed perfectly straight and firm, the patient must look, and by and by read. He is obliged, by this contrivance, when he wishes to see or read any thing, to turn the eyes inwards and downwards.

Frequently looking into the stereoscope, and endeavouring to bring the two images to coalesce, so as to see the object single and as if it stood forward in relief, is an exercise likely to be useful in divergent strabismus.

VIII. *Excision of a fold of Conjunctiva.* In slight degrees of strabismus, where division of a muscle would probably produce too great an effect, and lead perhaps to an opposite distortion, Deiffenbach had recourse to the excision of a vertical and pretty broad fold of conjunctiva, on the temporal side of the eye, if the strabismus was convergent; on the nasal, if divergent. The edges of the wound contracting as it heals, and the areolar tissue becoming condensed, have the effect of drawing the eye into the normal position.[25]

IX. *Cure of Strabismus by Myotomy.* 1. *History and principle of the operation.* The fact that strabismus is not dependent on any organic change in the muscle, *towards* which the eye is distorted, has, in all probability, been the cause why dividing the muscle was never put in practice till recommended by Stromeyer[26], so late as 1838. He was led to advise a trial to be made of dividing the adductor in cases of convergent strabismus, in consequence of his attention having been directed to the cure of deformities by the cutting across of contracted muscles and tendons. It is plain that the two cases are not strictly analogous; for the division of a muscle, to free a part which is confined in an unnatural position, such as the head in wry-neck, is an operation somewhat different in principle, from the division of the adductor in convergent strabismus. The latter operation does not sever a contracted indurated muscle, nor liberate the eye from an unnatural position in which it is bound down, but merely abridges the exorbitant activity of one force, in order to allow another force an opportunity of acting.

Stromeyer tried the operation only on the dead body. Pauli[27] was the first to attempt it on the living: but the eye was unsteady; he divided the conjunctiva, but could not divide the muscle. It was reserved for Dieffenbach to prove the advantages of myotomy or tenotomy, as it has been called, in the cure of strabismus, which he did, in numerous instances, towards the end of 1839.

2. *Condition of the textures of the eye.* The healthy or unhealthy condition of the textures of the eye should be noticed, and especially the state of the conjunctiva and cornea.

The operation is more difficult of execution, if the eyeball be small and sunk in the orbit, than if it be large and prominent.

If the eyeball be large, it will be less acted on by the inner fibres of the levator and depressor, unless their tendons are broad in proportion, which does not appear to be the case. In such circumstances, therefore, parallelism of the eyes is likely to be restored by the division of one adductor.

If the eye has suffered much from inflammation, which is sometimes evident from specks on the cornea, and in other cases from the conjunctiva appearing darker, drier, thicker, and less moveable than natural, there is a probability that the conjunctiva and the structures which lie between the conjunctiva and the sclerotica are abnormally adherent, a circumstance which is apt to render the operation difficult, and less successful. A squinting child, being seized with scrofulous ophthalmia, is very likely to have the eye fixed in the inner canthus by adhesion of the subconjunctival textures, till on the inflammation subsiding, and the eye becoming again capable of being used, the unnatural connections are gradually elongated into cellular bands, by the action of the abductor.[28]

A speck on the cornea of a squinting eye is no objection to the operation, provided the other eye is the better of the two; but if the squinting eye is that on which the patient chiefly depends for vision, the distortion may be an instinctive provision, by which he sees more than he could do, were the eye straight. In such a case, to cure the strabismus might be the means of materially abridging the range of vision of the eye, and ought therefore to be avoided.

Alternate strabismus may be a means, when both corneæ are partially opaque, of permitting the rays of light to penetrate through the clear portions of the corneæ, and thus reach the retinæ. Were the strabismus in such a case cured by an operation, an artificial pupil in each eye might be required, before the former degree of vision could be regained.

3. *Extent and acuteness of vision.* The extent and acuteness of vision of each eye separately, and of both together, should be carefully examined before proceeding to the operation, in order that we may be able afterwards to form a correct estimate of its effects.

The vision of a squinting eye is, in general, so defective that the patient cannot read an ordinary type with it. In some cases, it does not serve him to read a large type, nor even to know one person from another. There is reason to believe, that the vision of the one eye being so much more impaired than that of the other, often originates in the wearing of a shade over that eye. The imperfect vision occurs about the same time as the mutual convergence, but does not cause it. "Reflex or sympathetic irritation of the nerves of the third pair," says Mr. Elliot, in a letter to me, "by causing an increased action of the muscles which they supply, gives rise to the mutual convergence, or new moving association; and as the mutual convergence prevents the directing of both eyes on the same object at the same time, the clear-sighted eye will obey the will of the patient, while the other is subservient to the moto-nervous connection of the two organs."

In non-alternating cases, it is generally possible to remove the distortion from the better eye to the worse, by bandaging the former, and thus improving the vision of the latter by use.

In some rare instances, a part of the retina to one side of the vertex is more sensible than the vertex itself. When this is the case, the distorted eye remains so, although the opposite eye is closed, and the patient regards an object straight before him; but on moving the object to one side, the distorted eye becomes straight.

Occasionally the distorted eye is completely amaurotic; and in this case the operation must be regarded merely as a means of improving the patient's appearance.

In alternating strabismus, the vision of the two eyes is about equal. In strabismus, without alternation, the degree of distortion and the inferiority of vision of the worse eye are generally proportionate. The eye, the vision of which is the more imperfect, is always to be chosen as the subject of operation.

When the vision of both eyes is good, but the convergence great, two operations will be required. The convergence being slight, although the vision of the worse eye is very bad, one operation will be sufficient. Limited abducting power and smallness of the eyeballs are more likely to render necessary the division of the second adductor, than any state of the vision.

4. *Date and permanence of the strabismus.* There are children, and even adults, who occasionally squint, but can prevent the distortion when on their guard. A recent and transient strabismus is not unfrequently the result of intense use of the eyes, mental agitation, or irritation communicated from the abdominal viscera to the brain. Such cases should be treated with rest, purgatives, tonics, and proper exercise of the eyes. It is only when strabismus has continued for a considerable length of time, generally for years, and has attained the character of being *confirmed,* that we should think of remedying it by operation.

5. *Instruments necessary for the operation.* The tendon of any of the recti might be divided in many different ways.

A fold of conjunctiva, over the tendon of the adductor, for example, might be raised with a dissecting forceps, the fold divided by the stroke of a small scalpel, and, by another stroke or two, the tendon, thus exposed, might be cut across.[29]

A small snip being made through the conjunctiva, opposite to the lower edge of the adductor, one blade of a pair of scissors might be pushed up behind the tendon, the scissors closed, and the tendon and conjunctiva divided at once.[30]

M. Guerin's operation is said to be subconjunctival.[31] He pushes, I suppose, a narrow knife through the conjunctiva, and between the tendon and the sclerotica. Then, turning the edge of the knife towards the tendon, he divides it, leaving the conjunctiva by which it is covered entire.

The danger that the sclerotica might be opened in such modes of operating, especially were the operation attempted by an inexperienced hand, is sufficiently obvious; and, therefore, a safer, although a little more operose, plan of proceeding ought to be adopted.

The instruments more immediately necessary for the operation are:—

1. A small dissecting forceps, or toothed forceps, such as that represented in *fig.* 28, page 219.

2. A pair of small, straight, blunt-pointed scissors, which cut perfectly.

3. A blunt hook, about one-fortieth of an inch thick, and the bent part nine-twentieths of an inch long.

4. A fine sharp hook, such as is commonly contained in cases of eye-instruments.

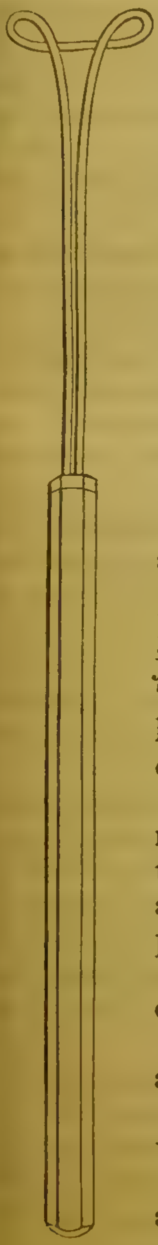

Fig. 41.

Wire specula, such as the speculum represented in *fig.* 41, are sometimes used for retracting and fixing the eyelids; but the fingers of an assistant produce less uneasiness to the patient, and do not interfere so much with the manipulations of the operator.

A small bit of sponge, with cold water, should be at hand.

6. *Position of the patient.* If chloroform is not used, and the patient is an adult, he should be placed on a seat without a back, so that he may lean his head on the breast of an assistant standing behind him. If he possesses ordinary command over the muscles of the squinting eye when the opposite eye is closed, so that he can turn it considerably from its distorted position, and keep it so, one assistant may be sufficient; but if he cannot do this, a second assistant is necessary. If the patient is a child, and no chloroform given, more assistants than two may be required; and the patient, being wrapt in a sheet, so that his arms and legs are kept at rest, is to be laid on a table, with his head on a pillow. It is of great advantage, however, to put a child about to undergo the operation under the influence of chloroform. It is then unnecessary to wrap him in a sheet. If chloroform is given to an adult, he should be laid in the horizontal position.

7. *Operation.* The opposite eye being covered with a compress, an assistant with the fore-finger of one hand raises the upper eyelid, and with that of the other depresses the lower.

The operator now desires the patient to turn his eye as much as he can, in the direction which extends the muscle about to be divided. If the case is one of convergent strabismus, he desires him to look outwards, to his temple; if it is one of divergent strabismus, he desires him to look inwards, to his nose.

We shall suppose the case to be one of convergent strabismus. The reader will easily conceive that many of the observations regarding the cure of convergent strabismus may be applied to that of the divergent variety, by substituting *abductor* for *adductor*.

The steps of the operation, then, are as follow:—

1. With the forceps, the operator lays hold of the conjunctiva transversely, midway between the edge of the cornea and the caruncula lacrymalis, and raises it in a horizontal fold.

2. With the scissors, he snips this fold through vertically, along with the subjacent cellular substance, and then enlarges the incision thus begun, upwards and downwards, so that it extends to half an inch in length. Having done this, it is well to take up the subconjunctival fascia with the forceps, and divide it either in the whole extent of the wound, or at any rate opposite to the lower and upper edge of the tendon of the muscle. This greatly facilitates the third step of the operation.

The incision should not be nearer the cornea than half way between its edge and the caruncula, lest in attempting to pass the blunt hook under the tendon, the operator find it impossible to do so, from the close attachment of the tendon to the sclerotica; nor ought it to be farther from the cornea, else the operator will require to penetrate deep by the side of the eyeball, to reach the muscle.

The conjunctiva is merely to be slit up to the extent specified; it is not to be dissected from the subconjunctival fascia, nor is any portion of it to be cut away. In this way the wound will heal more readily, and the eye be less apt to protrude after the operation.

The incision of the conjunctiva is generally made in a vertical direction. In operating for divergent strabismus, it appears to be Mr. Elliot's plan to open the conjunctiva horizontally. Perhaps the incision made in this direction will gape less than a vertical one, but more separation of the membrane from the subjacent fascia will be required to bring the tendon into view. A frænum will also be apt to form between the cicatrice of the conjunctiva and the external canthus.

3. The patient again everting the eye as much as he can, and the parts, if obscured with blood, being sponged, the operator insinuates the point of the blunt hook under the lower edge of the tendon of the adductor, and slides it up between the tendon and the sclerotica, till its point appears above the upper edge of the tendon, as is represented in *fig.* 42. If there is any difficulty in bringing out the point of the hook at the upper edge of the tendon, from its carrying the fascia before it, the operator snips this through with his scissors, and frees the point of the hook.

In this part of the operation, unless the incision be nearer than usual to the cornea, or the operator take the trouble of removing a portion of the fascia, it is rarely the case that the fibres of the tendon are distinctly perceived. They are obscured by the fascia, which is generally by this time infiltrated with blood. The operator, therefore, introduces the point of the hook where he thinks the lower edge of the tendon should be; and pressing it close along the surface of the sclerotica, he takes up on the hook everything that lies between the sclerotica and the surface exposed by the incision of the conjunctiva. The hook, entering the cavity of the ocular capsule, where the cellular connection of the tendon to the sclerotica is naturally loose, is easily passed beneath the tendon. This part of the operation, therefore, gives little pain, unless the hook is not sufficiently bent, or the bent part too long, so that it must be brought out over the eyelids, and by putting the muscle on the stretch, drag severely on the eyeball.

It is seldom that the patient is unable to evert the eye sufficiently to allow the first and second steps of the operation to be performed, with no farther assistance than what has now been mentioned; but it sometimes happens that he cannot continue the eversion, at least to the necessary degree, to permit of the third step. When this is found to be the case, the operator lays hold with the sharp hook, of the tunica tendinea, or, in other words, of the tendon of the muscle where it is exposed through the incision of the conjunctiva, and without passing it deeper than the surface of the sclerotica, he moves the eye into the everted position. This is effected with a very slight degree of traction. He then intrusts the sharp hook, thus fixed, to an assistant, and proceeds to pass the blunt hook.

If artificial eversion is called for at the commencement of the operation, which sometimes is the case, especially in children, the operator passes the sharp hook through the conjunctiva and into the tunica tendinea, about one-fifth of an inch from the inner edge of the cornea, and having drawn the eye into the position required, intrusts the sharp hook to an assistant, till the first, second, and third steps of the operation are completed. After the blunt hook is passed under the tendon, the sharp hook may be removed.

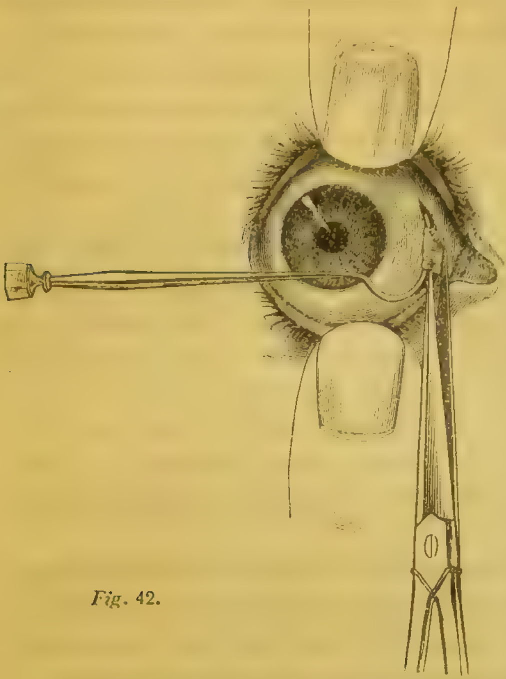

Fig. 42.

At whatever step of the operation the sharp hook is used, it must be fixed in the tunica tendinea. It is useless to fix it in the conjunctiva; as this membrane, when we endeavour to move the eye by traction on the hook, yields, and slides away from the subjacent textures. To penetrate the sclerotica with the sharp hook, is unnecessary.

4. The operator now takes the blunt hook in his left hand, and carrying the handle of it towards the temple, with the scissors he immediately divides, in ordinary cases, the tendon of the muscle from below upwards, and nearer the caruncula than where it is over the hook, as is represented in *fig.* 42.

In this manner of operating, the muscle will most frequently be divided just where the tendinous part meets the fleshy fibres.

If the distortion is slight, the handle may be carried over the nose, and the tendon divided nearer the cornea than where it lies over the hook, and close to its insertion.

If the distortion is great, the operator, before proceeding to use the scissors, should separate a considerable portion of the internal surface of the muscle from the sclerotica. Dr. Ammon[32] does this by pressing the blunt hook repeatedly towards the cornea, and back again towards the caruncula. Mr. Elliot[33], for the same purpose, introduces a second hook, and steadies the eye by means of the one already under the tendon. The tendon being then drawn into view, the muscle is to be divided. If hypertrophied, a part of it should be cut out, which is best accomplished by passing a ligature under it with a blunt needle, tying the ligature upon the muscle, dividing the latter nearer the caruncula than where it is within the ligature, and lastly, cutting off the ligature, with the portion of the muscle which it embraces.

If, in the third step of the operation, only a portion of the tendon, and not its whole breadth, appears to be upon the blunt hook, the division with the scissors should not be immediately proceeded with; but, with another and smaller blunt hook, the operator should take up the remaining breadth of the tendon; and having divided this portion with the scissors, proceed to divide the principal portion, which he has on the first hook. It must be remarked, however, that when the tendon is raised and drawn forwards on the concavity of the blunt hook, it generally assumes a round and contracted appearance.

If the operator has any doubt about his having divided the whole of the muscle, he should not proceed to ascertain the position of the eye, and much less incautiously announce to the patient that the operation is finished, until he has examined with the blunt hook, and snipped across any portion which may have escaped. The tuft formed by the minute tendinous fibres, adhering to the sclerotica, at the place of insertion, will show distinctly that the muscle has been divided.[34]

Such, then, is the operation for convergent strabismus. That for the divergent variety is generally considered rather more difficult, owing to the greater narrowness of the space between the eyelids, and the insertion of the abductor being farther from the cornea than that of the adductor. As to this, a good deal will depend on the size and prominence of the eye.

Upon the same general plan, the levator or depressor is to be divided, in cases of distortion upwards or downwards.

I have described the operation as performed with the aid of the blunt hook, as being the safest plan to be followed by those who have not operated much for strabismus. After he is familiar with the operation, the surgeon will often at once pass the blade of the scissors beneath the muscle, after exposing it by a division of the conjunctiva, and not use the hook at all.

8. *Immediate effects of the operation on the relative position and motion of the eyes.* If the adductor or abductor has been divided, certain effects are immediately produced on the mobility of the eye which has been operated on, and on the relative position of the two eyes.

1. The compress being removed from the opposite eye, the patient finds that he can turn the eye which has been cut, fully and with a feeling of freedom, towards the temple or towards the nose, according as the adductor or abductor has been divided. This, which he could not do before, is a proof that the tendon has been fairly divided, If he cannot turn the eye freely, there is reason to suspect that the tendon has not been completely divided, or has not been sufficiently separated from the sclerotica.

2. When the patient looks directly before him, and the operation is complete and successful, the distortion which previously existed is removed, and the optic axes are parallel. In some cases, they retain their parallelism when he turns his eyes to the right, if the right adductor or left abductor has been divided; or towards the left, if the left adductor or right abductor has been the subject of operation. On closing the eyes, and suddenly raising first the upper lid of the one, and then that of the other, the opposite eye being kept shut, there is no distortion to be seen in either. The operation on one eye has removed the mutual convergence, and restored parallelism.

After the division of one adductor, the eye may be observed occasionally inverted. If, on closing the clear-sighted eye, the inverted one becomes straight, and on raising the lid of the closed one, both eyes are straight, there is evidently no remaining mutual convergence, and by exercising the eye which has been operated on, the other being bandaged, the cure will be established, without further operation.

3. It is generally believed, that when the operation is complete, and promises to be successful, the eye has lost the power of being turned into the inner canthus, when the adductor has been cut, or

into the outer canthus, when the abductor has been divided. It has also been stated, but there is reason to believe upon still more insufficient grounds, that, after the adductor has been cut, if the patient retains the power of turning the eye nearer to the nose than the centre of the orbit[35], either in a horizontal or an oblique line, the operation has not been completely performed, or is not going to effect an immediate cure. In the great majority of cases it will be found, that the eye can be inverted considerably beyond the centre, but not so much as to conceal the inner edge of the cornea. This remaining power of inversion is commonly ascribed to the action of the internal fibres of the levator and depressor; but M. Bonnet is of opinion that the motion arises from the connection still subsisting between the divided muscle and the ocular capsule, the muscle continuing to act on the capsule, and thence mediately transmitting its influence to the eyeball. Mr. Elliot mentions to me, that on dividing both abductors, he has always found the power of eversion of each eye to be natural, immediately after the operation.

If the patient, after the adductor has been divided, retains the power of turning the eye into the inner canthus, so as to conceal the whole of the white of the eye internal to the cornea, the operator, replacing the compress and roller over the opposite eye, should immediately proceed to examine with the blunt hook, whether any portion of the tendon has escaped division, as is very apt to happen at its lower or upper edge, or whether the internal surface of the muscle is still adherent to the sclerotica, or is bound to it by any adventitious connection. Any such undivided portion of the tendon, or unnatural bands of attachment, are to be drawn into view with the hook, and snipped through. If this is still insufficient, the external surface of the tendon should be examined in the same manner, and its cellular union to the fascia should be separated, so that the tendon may lie loose and unattached, as far back as the aperture by which it traverses the capsule, which is about half an inch.

4. It is often the case that, notwithstanding the complete division of the tendon, and its being carefully separated from its cellular attachments, the distortion still continues, without any, or with merely a slight diminution.

At one period, the general opinion of operators regarding such cases appears to have been, that the disease was confined to the worse eye, the better eye being so little affected as to pass for being sound, and that the want of success attending the division of the adductor was to be remedied by dividing the levator or depressor[36], or one or other of the obliqui.[37] Farther experience, however, has shown that any interference with these muscles is unnecessary, if the adductor be carefully examined, and liberated from the adventitious adhesions by which it is often tagged to the neighbouring parts.

Another notion, at one time pretty general, was that, although the original distortion should still remain in some degree after the adductor was divided, the operation was not to be immediately deemed a failure. It was urged, especially if the patient, previously to the operation, had been unable to bring the pupil to the central position, that the abductor might require time to recover its contractile power, so that hours or days might elapse before the eye reached the centre of the orbit, although ultimately a perfect cure might be obtained.

This gradual amendment is not to be trusted to. On the contrary, an eye that is not placed in the centre of the orbit at the termination of the operation, rarely, if ever, assumes of itself that position afterwards, but generally becomes worse.[38] It is not, however, by making a clean dissection of the whole nasal side of the sclerotica, nor by dividing other muscles than the adductor, that the rule is to be fulfilled, *always to leave the eye straight.*

To place the eye in the central position, Mr. Wilde, having bent a small sewing-needle, and armed it with a fine ligature, seizes hold of the end of the divided muscle where it is attached to the sclerotica, and passes the thread twice through it, drawing it tight the second time, thus obtaining a power by which the eye is easily moved to a side. He then attaches the ligature by means of adhesive plaister to the cheek, if the adductor was the muscle divided; to the nose, if the abductor. It should not be removed while it continues on the stretch, or, in other words, till the eye has completely righted itself. In attaching the ligature to the cheek or nose, care should be taken that it does not cross the cornea.[39]

Mr. Elliot, from a careful consideration of cases in which the division of the adductor of the inverted eye failed in removing its distortion, concluded that the disease could not be regarded as confined to one eye; since, when the better eye was closed, the worse one, after the operation as well as before it, became straight; while on raising the lid of the better eye, it was found inverted, though the position of the eyes instantly became reversed when both were opened. The simple experiment of closing the better eye after the operation shows, by its rendering the worse eye straight, that the remaining distortion which is seen in the worse eye when both are open, does not depend on any shortening of the fibres of the levator, depressor, or obliqui, requiring that they should be cut, or on any semi-paralytic state of the abductor, from which it may slowly recover, but on the original cause of the disease—a morbid action of the motor nerves.

In such cases, then, of mutual convergence, in preference to the division of the levator or depressor, which, though it might restore parallelism, would leave the eye prominent and limit its future movements, and in place of trusting to exercise of the eyes, which, though it might succeed in some instances, after a practice of weeks or months, in rendering the first eye straight, would fail to do so in those cases where, from various causes, such as a speck of the cornea, partial cataract, or insensibility of the vertex of the retina, the vision of the eye was incapable of being much improved by exercise, Mr. Elliot had recourse to the immediate division of the same muscle of the opposite eye, and with signal success. To estimate fully the merits of this improvement, which certainly in importance stands next to the original invention of the operation, the reader should study with care the cases detailed by Mr. Elliot in his paper in the Edinburgh Medical and Surgical Journal, already referred to.

5. It sometimes happens that the inversion is instantly removed from the worse eye as soon as its adductor is divided, and appears,

though not in the same degree, in the other eye; or, when the strabismus is divergent, the eye operated on becomes straight, and the other everted.

Mr. Elliot has fully established the immediate division of the same muscle of the eye to which the distortion has shifted, as the means of rendering the eyes parallel in such cases.

Whether the strabismus, then, be convergent or divergent, when the division of the adductor or abductor, as the case may be, of the worse eye fails to restore parallelism, the distortion either remaining in the eye which has been operated on, or shifting to the other, in consequence of continued mutual convergence or divergence, it is a general rule, that the same muscle of the better eye should be divided.

Parallelism, in such cases, will never be perfectly restored by any other means. By waiting, before cutting the second eye, and exercising the one which has been operated on, the inversion or eversion of the latter may be removed, but it will be at the expense of the former, which will become inverted or everted. Besides, it is desirable to operate on both eyes, as this plan, when properly managed, always effects the best cure.

In operating on the second eye, it is generally sufficient to divide the tendon, close to its insertion, without interfering at all with its cellular attachments. This caution is necessary, lest, by separating the surfaces of the tendon from the capsule and sclerotica, eversion of either eye might follow. This cannot happen, if the distortion is mutual, till the inversion of the first eye be removed. If a mere division of the tendon does not remove the convergence, the blunt hook should be re-introduced, and the muscle separated from the eyeball to the necessary extent. It is generally the case, however, that the instant the second adductor is divided, the eyes become parallel.

It is probable that the true explanation of the fact, that a great number of those who have been operated on for strabismus still squint, is, that the mutual affection of both eyes has been overlooked, and only the worse eye operated on. Dr. Lietch[40], with an experience of 264 cases, states that the operation "often affords very satisfactory results," which very moderate testimony in its favour ought probably to be attributed to the cause now mentioned.

Mr. Duffin's account of the effects of the operation for divergent strabismus is still less encouraging. He states that the eye does not start into its place as soon as the abductor is divided; but requires several days, in some instances, before it is re-instated; and, that although a considerable improvement takes place, the cure is very seldom perfectly successful. "The capability of moving the eyes towards the nasal canthus, by an effort of the will, remains," says he, "precisely the same as before. Nothing has been gained in this respect; the patient has not acquired the power of directing both eyes inwards simultaneously. In fact, all the apparent advantage obtained is, that when quiescent, the pupils of both eyes occupy the visual axis of their respective orbits, instead of only one doing so, while the other is directed outwards."[41]

Such undoubtedly will generally be the state of matters, after an operation on one eye only, for mutual divergence. In Mr. Elliot's hands, cases of divergent strabismus, by the division of both abductors, have been perfectly cured. I have had the pleasure of examining one of his patients, who had been affected with divergent strabismus for thirty years, in whom the cure is complete; every movement of the eyes, and even their convergence on viewing near objects, being perfectly normal.

6. Immediately after the adductor is divided, the abductor sometimes acts too powerfully, and turns the eye towards the temple; but in two or three days the eye generally resumes its proper position. The eversion in such cases is attributed by M. Bonnet to too free a dissection of the conjunctiva; but it is probable that it arises oftener from too much separation of the tendon from the sclerotica, in cases of moderate distortion.

7. In a case related by Mr. Duffin, in which the distortion was inwards and upwards, the effect of dividing the adductor was, that the eye turned directly upwards, requiring the levator to be cut across.

9. *Wound.* 1. In general, only a few drops of blood are lost in the operation. If the incision of the conjunctiva is nearer the caruncula than the distance already specified, the conjunctiva extensively separated from its connections, or the fleshy part of the muscle divided, the hæmorrhage may be more; but is scarcely ever such as to impede the operation.[42]

2. The pain which attends or follows the division of one of the recti is generally inconsiderable. It is rare to find that the eye becomes intolerant of light, or affected with burning heat or inflammatory throbbing.

3. The wound of the conjunctiva often gapes very much, especially when the abductor has been cut; but the edges come together of themselves in the motions of the eye, and any serous or sanguineous infiltration under the conjunctiva is, in general, slight. Some operators use fine stitches to bring the edges of the wound together, trusting that this will tend also to prevent unnatural prominence of the eye.

Left to itself, the wound never heals by the first intention, but it rarely suppurates. Lymph is effused between its edges, and it generally closes in a fortnight or three weeks. In some cases, however, the lips of the divided conjunctiva become swollen, red, and elevated; and this state must subside before the wound heals. Occasionally the sclerotica close to the caruncula throws out a fungus, which hangs by a pedicle, and may grow to the size of a pea. The application of caustics to the fungus is of little or no use. It is better to lay hold of it with the forceps, and snip it off with the scissors. Should it grow again, this must be repeated. The wound which has become fungous, takes several months to heal.

4. In one instance only have I seen disorganising inflammation attack the eyeball after the operation for strabismus. Called into consultation in this case, I was informed that the adductor had been divided without difficulty twelve days before; but that the patient had conducted himself imprudently, and had caught cold. I found the eye turned towards the temple, with much swelling and inflammation at the inner canthus. The sclerotica had already sloughed to the extent of about one-third of an inch in diameter, so that the choroid,

covered by a lymphatic exudation, protruded. Ulceration was extending to the nasal edge of the cornea; the pupil was clear and small. In a few days the choroid gave way by a minute opening, and allowed the vitreous humour to drain out of the eye. At my third visit the eye was in a state of total exophthalmia, tense and much protruded, and the cornea disorganised. Ultimately, the eye shrunk. The patient was bled at the commencement of the inflammatory symptoms, leeched, and mercurialised. Latterly, opiates and poultices were used.

10. *After-treatment.* 1. Afraid of re-action, we are induced to put the patient to bed, directing him to keep his eyes shut, and the one operated on covered with cold wet cloths. So little, however, is the tendency to re-action, that labouring people not unfrequently tie up the eye with a handkerchief, and with the aid of the other eye resume their usual employment the day after the operation, without experiencing any bad effects. There seems even a danger in keeping both eyes constantly shut, after an operation for convergent strabismus; for, as in that state they turn upwards and inwards, the operated one must approach its former position, the consequence of which might be that the muscle, by adhering to the sclerotica too far forwards, would cause the distortion to return to a certain extent, as soon as the process of healing was complete. The danger of such an event would be lessened by the patient's employing even the opposite eye, and still more certainly by using both eyes, within doors, and under the cover of a shade. A green veil is very convenient, affording warmth, excluding too much light, and allowing a free use of the eyes.

The advice commonly given is, that with the opposite eye tied up, the patient should use the operated one, and turn it frequently in the direction opposed to the former distortion; to the right, if the right adductor has been divided, and *vice versâ.* The exclusion of the opposite eye, however, if it has not been operated on, only indulges the inclination it already has to squint, and the turning of the eyes to the right, if the right adductor has been divided, favours a continuance of mutual convergence. In fact, the opposite direction rather should be given to the eyes, so as to make their axes diverge, and not converge. After the abductor is divided, the patient should look to neither side; but direct his eyes straight before him, or even towards small objects placed a few inches from his nose, so as to make the eyes converge.

2. Three or four times a day, the eye should be fomented with warm water, or decoction of poppy heads.

3. The patient should eat no flesh, nor take alcoholic drinks of any sort.

4. He should avoid going out of doors with the eyes uncovered, overheating himself, exposing himself to cold, or looking intently upon minute objects, as in reading or writing.

5. Puro-mucous inflammation of the conjunctiva supervening is to be treated with the usual remedies for catarrhal ophthalmia.

11. *Pathology of strabismus, as illustrated by the operation.* A question naturally occurs, What light has the operation thrown on the pathology of the disease?

1. The conjunctiva and subjacent textures have not unfrequently been found, especially at the inner canthus, unnaturally adherent[43]; sometimes thickened, contracted, and infiltrated to such a degree, that they felt like cartilage under the scissors.[44]

2. In general, the muscle which is exposed and divided appears quite natural, in colour, consistence, and insertion.[45]

3. In some instances, the muscle has appeared in a thickened state, and rounder than natural, has bled more than usual, has been more difficult to divide, and more tendinous than common—in a word, hypertrophied.[46]

4. In a few instances it has been atrophied.[47]

5. Bifurcation of the fleshy belly of the adductor has been met with.[48]

6. The rectus internus has been found displaced upwards, causing distortion upwards and inwards.[49]

7. Irregular attachments of the muscle have been met with, its insertion being further back than common, and bundles of fibres inserted behind the proper tendon.[50]

12. *What becomes of the divided muscle?* Whether it be the tendon or the fleshy part of one of the recti which is divided, the muscle contracts remarkably in breadth, and is drawn back within the capsule. Even the fleshy part, which lies behind the capsule, suffers a degree of retraction. After a time, the muscle becomes re-attached to the sclerotica by cellular adhesions.

Dr. Ammon states, that, when the tendon is separated from the sclerotica, and cut through, the muscle retracts less that when the fleshy part is divided. If the fleshy part is divided, or a piece of it cut out, the muscle contracts so as to become round and narrow, and the space left between the cut surfaces fills with blood, which also surrounds the divided ends. By and by, coagulable lymph is effused. Sometimes the wound heals speedily, the muscle re-uniting, and a firm mass of a dark colour, small and round in comparison with the original structure, occupying the space between the divided ends. The muscle, in this state, is described by Dr. Ammon as presenting the appearance as if it had been tied for some time with a ligature. In other cases the ends do not reunite, but become firmly adherent to the sclerotica, and to the capsule.

The degree of retraction, which the divided muscle undergoes, varies in different cases, and consequently the place of its adherence to the sclerotica varies. Bernoulli[51] calculated that the greatest contraction of the recti, in the natural motions of the eyes, equalled very nearly one-fifth of their length. If this degree of contraction takes place after one of these muscles is divided, the divided ends will be separated more than a quarter of an inch from one another, and the point of re-adhesion to the sclerotica will be behind the transverse diameter of the eye-ball. When the conjunctiva and subjacent textures are in a natural state, and the motions of the eye free, the muscle will contract to at least a fifth of its natural length; but where inflammation has matted the parts unnaturally together, the contraction will be much less. In a case of relapse, operated on a second time by Mr. Lucas[52], he found the new insertion of the muscle to be only about one line and a half behind its original attachment. In an eye dissected by Mr. Hewett[53], a month after division of the adductor, the patient having died of phthisis, the muscle had retracted to the distance of three-quarters of an inch from its natural attachment, but still remained connected to the eyeball by a strong band of cellular tissue. This band was about three lines in width, and about six lines in length, and was attached to the eyeball about two lines behind the original insertion of the muscle. In this case the retraction of the muscle must have surpassed considerably one-fifth of its natural length.

13. *Unfavourable effects of the operation.* Some of the unfavourable effects which are apt to arise from the operation are trivial, but others are important.

1. The white cicatrice of the conjunctiva, in the situation of the wound, is of no moment.

2. The eye, which has had its adductor divided, presents a greater gap between the cornea and caruncula than natural; the caruncula is more sunk, the lids more open, the eye more prominent and convex at the nasal angle. If the plan of dividing part of the levator or depressor, in addition to the division of the adductor, were followed, the eye would be particularly liable to project.

If both eyes have been operated on, both are rendered more prominent than natural; but being equally so, the circumstance attracts less notice. When only one eye projects, and the projection is great, the physiognomy is very remarkably and disagreeably affected. This affords a reason for operating on the opposite eye, if it presents the slightest degree of strabismus. If we venture to operate on a straight eye, or on one but slightly distorted, for the purpose of equalizing the projection of the two, the tendon should be divided close to its insertion, and with as little separation of its cellular connections as possible, for fear of eversion.

3. Whether one eye only, or both, have been operated on, double vision is not an unfrequent effect. In this case parallelism of the eyes has not been perfectly restored. If the adductor of one eye has been divided, and the eye is thereby everted in any degree, double vision occurs when the patient looks straight forward, or towards the other side. In general, this effect gradually subsides as the eye recovers the power of adduction, by the action of the inner fibres of the levator and depressor, and the re-adherence of the divided muscle to the sclerotica. The patient should be instructed to look forward at objects, and to avoid looking to a side, especially to the side which increases the double vision by causing divergence; to the left, for instance, if the right adductor has been divided. Except where each eye, being shaded in its turn, remains straight, tying up one of them only prolongs the evil.

4. One of the most annoying consequences of the operation is inordinate eversion of the eye, when the adductor has been divided. Too great a separation of the muscle, and dividing it too far from the cornea, are the causes of this effect, which is still more apt to occur, if, in addition to these causes, the motions of the eye had been previously free and the distortion slight, or if both eyes have been cut. Eversion may also be brought on, soon after the operation, by the

patient's looking too much to the side. In children, unless the wound of the conjunctiva is small, and the muscle simply divided, without separating it much from the sclerotica, eversion is very apt to occur sooner or later. A young lady from the West of Scotland, calling upon me with slight convergent squint, I advised her against any operation. She went to Edinburgh, where she was to be operated on without letting her friends know, the operation was so very easy, and she was to return with her eye straight in two or three days. Severe inflammation followed the operation, with great swelling of the eye, requiring the application of leeches, and keeping her in bed for six weeks. The eye turned to the temple, and thus she went home, ashamed to let herself be seen.

Extreme eversion is attended by a disagreeable expression of countenance, giddiness, and such a degree of double vision as unfits the patient for pursuing any employment, and even for walking about, with both eyes open.

The moment the surgeon observes a tendency to eversion, he should caution the patient against turning his eyes much to either side, and especially against such lateral motion as produces divergence of the optic axes, and should recommend him to look always straight before him, and to exercise his eye frequently on near and small objects. If the opposite eye does not become distorted on being closed, it should be bandaged for four or five weeks. If the eversion continues after this, the abductor should be divided. If the eye is inverted after an operation for divergent strabismus, the adductor may require to be divided, should such exercise of the eyes as tends to diminish the convergence, viz., looking forward at distant objects, prove unsuccessful. The division of the antagonist muscle, in either case, will allow the eye to resume its position in the centre of the orbit, and the lateral motions will be performed by the re-adhering muscles, and by the levator and depressor.

The mutual divergence which generally exists in cases of eversion, occurring after division of the adductor, may be remedied by operating on *either* abductor. In a patient operated on by Mr. Charles W. G. Guthrie[54], after the adductor of the inverted eye was divided, it gradually became everted. The case was now one of mutual divergence. After some weeks the abductor of the better eye alone was divided, which cured the eversion of the other eye, without any interference with its abductor. Mr. Guthrie's explanation or theory is not satisfactory. He mentions that from a train of reasoning he was led to select the better eye, as an operation on it alone would cure the eversion. This is not the case. The division of the other abductor would with equal certainty have removed the mutual divergence, though objectionable on account of the prominence it would have left from the division of two recti of the same eye.

Alternating eversion, on looking to either side, sometimes follows an operation for convergent strabismus. After division of the adductor of one eye, for example, it has happened that the patient, on looking at any object placed straight before the eyes, directed the axes of both correctly, so that no obliquity could be detected, and vision was single. If, however, without turning his head, he regarded any object placed a little to either side, the eye of that side was instantly everted to a very considerable extent.

In a case of this sort, in which the left adductor had been divided by Mr. Duffin[55], when the object was placed to the left side, the eyeball was so much everted, that two-thirds of the cornea were concealed in the outer angle of the orbit, the opposite pupil occupying its proper position. When the object was placed to the right side, the right eye was everted in the same manner, while the left remained straight.

In another case, related by Mr. Duffin, the same alternating eversion happened after both adductors had been divided. The patient could direct both pupils with the utmost precision, when the object was placed immediately before her; but if it was removed even a few inches to either side, and she continued to look at it without turning her head, the abductor of the eye on the side to which the object was moved immediately exerted an undue ascendancy, and drew the pupil so much to the outer angle, that vision instantly became double, and a most ungainly cast supplanted the original distortion.

If unfortunately alternating eversion does occur, the same exercise of the eyes, as has already been recommended, should be followed. Avoiding as much as possible lateral movements of his eyes, the patient should look at small objects placed near and straight before him. In Mr. Duffin's cases, the mutually controlling power of the muscles of the two eyes gradually returned, so as to render any operation on the abductors unnecessary.

14. *Relapse.* The same general principles which guide us in operating, or in refraining from operating, on the second eye, and in exercising the eyes immediately after the operation, are to be applied in cases of relapse.

1. It not unfrequently happens that, although the eye which has been operated on, occupies its proper position immediately after the operation, it becomes occasionally inverted a week or two afterwards. If the inversion is removed by closing the other eye, which in its turn does not become inverted, as is seen on suddenly raising its lid, the good eye must be bandaged, and the other regularly exercised, till the cure is complete and permanent. The same plan is to be followed, if occasional eversion follows the operation, the opposite eye remaining free from any implication.

2. By operating on the worse eye only, its position is sometimes perfectly remedied for the first few days, after which the strabismus is very apt to return to the same eye, although not in the same degree, for the patient is never able to conceal any part of the cornea in the inner canthus, after the division of the adductor. In other cases, the distortion settles in the better eye. The same is very apt to happen in alternating cases, if only one eye has been operated on. Under any of these circumstances, Mr. Elliot's plan should immediately be adopted, viz., the division of the same muscle of the second eye, as the surest means of removing the mutual convergence.

If the patient refuses to submit, exercise of the eyes, or what a French critic calls *orthophthalmic*[56] practice, must be tried. In such cases, bandaging either eye is useless, as it only substitutes the inversion of the one eye for that of the other, and would confirm the distortion in the eye which was covered. Such exercise as everts the eye which has been operated on for convergent strabismus, seems, at first sight, to be indicated in such cases, and is the practice usually followed; but a little reflection will show that this is the very means to confirm the mutual convergence. Mr. Elliot, therefore, recommends that the patient should be directed to look to that side which will cause the two eyes slightly to diverge from each other; to the left side, if the right adductor has been divided, and *vice versâ.* If the right adductor, for example, has been divided, its incomplete power of inversion will cause the two eyes to diverge a little, when the patient looks fully to the left with the left eye. Mr. Elliot calls this *side-practice,* and acknowledges that it would be the most likely plan possible to increase the original evil, were this really, as is too generally supposed, confined to the inverted eye; but urges its success as a strong proof of the truth of his views regarding the mutual affection of the eyes in strabismus.

The cause of relapse has been attributed by some to the muscle re-adhering too soon, and too near its former attachment. To prevent such an occurrence, the eye has sometimes been drawn forcibly outwards a day or two after the operation, while the adhesions might still be ruptured; a very rough treatment, which is not to be recommended. A repetition of the operation has also been had recourse to, on the ground that the abductor, opposed by the re-union of the adductor to the sclerotica, requires a second opportunity of contracting. It is thought that this opportunity will be afforded to it, by again separating the adductor from the sclerotica, and that by this means the cure will be accomplished. That a continued inversion, however, of the same eye, after the first operation, does not depend on any impaired contractile power of the abductor, is evident from the fact, that the patient can, not only bring the eye to the central position before it is operated on, but evert it more or less on shutting the opposite eye. If the abductor can do this before the adductor is divided, it will be still easier for it to do so after the operation. The fault in cases of relapse does not lie at all in the abductor, but in the reciprocal affection of the two eyes not being overcome, and perhaps not understood.

In repeating the operation very sharp scissors are necessary to divide the cicatrice. The incision of the conjunctiva requires to be free, in order to get through the effused lymph, behind which the muscle is to be exposed. It is more difficult to pass the blunt hook than in a first operation. The parts bleed more, but the re-action is not greater.

If the operation, in the first instance, has been performed according to the rules already laid down, and the better eye operated on as well as the worse, it is not likely that a repetition of the operation will be required in any case.

The only admissible excuse for repeating the operation would be a conviction, on the part of the operator, that he had not separated the tendon completely. The operation may fail, if a slip of tendon, however slight, remains undivided. The operator being satisfied that the operation was complete, he should abandon any idea of repeating it on the same eye, and operate on the other eye, which will both remove the strabismus and make the eyes equally prominent.

3. Relapse seldom supervenes after both adductors are divided. When it does, Mr. Elliot tells us that it is easily removed by exercise. If the relapse affects one eye, and the distortion is removed by closing the other, which does not become distorted in its turn, this eye is to be bandaged till the vision of the eye which had relapsed becomes improved, and parallelism is restored. If the eye which is closed does become distorted, bandaging is useless, and the patient must be directed to practise looking to either side, till the eyes are accustomed to their new association. In a case related by Mr. Elliot, in which both adductors were divided, the right eye being the worse of the two, for three days the eyes remained straight. The right eye then gradually relapsed, so that nearly all the white internal to the cornea was concealed, while the patient looked straight forward with the left. In this case, the usual mode of exercising the right eye, by directing the patient to look dextrad, whenever he had an opportunity, was followed by an advantageous result. If the vertex of the retina of the distorted eye is insensible, bandaging the opposite eye would be worse than useless. Side-practice must be tried.

4. In cases of divergent strabismus, in which both abductors have been divided, it sometimes happens that a slight eversion of one or other eye, generally of the worse one, occurs some days after the operation. The patient is to practise looking forward at near and small objects.

15. *Orthophthalmic practice.* Success in curing strabismus depends much on the patient's persevering in well-directed practice.

Three varieties of practice have been referred to in the preceding pages; viz., the *parallel*, the *diverging*, and the *converging*.

1. If, in any case, parallelism can be produced by covering the better eye, it ought to be bandaged, and the other eye exercised. If, by a continuance of this *parallel* practice, the sight of the worse eye is made to equal that of the better, a permanent cure, without operation, will be the result.

After an operation for strabismus, if the distortion relapses, is confined to the eye operated on, and is attributable merely to an effort made by its levator and depressor, parallel practice will be all that is required.

The only effect, on the other hand, of bandaging one eye in cases of distortion involving both eyes, either before or after operation, is reversing the position of the eyes, so that the utmost to be gained by such a practice would be a permanent change of the inversion or eversion from the one to the other, by producing a change in their relative powers of vision.

2. If, after an operation on one adductor, there is any relapse, or renewal of the mutual convergence, as will be shown by inversion of the worse eye, the patient must employ Mr. Elliot's *side-practice*, or *diverging* practice. For instance, if the left eye was the worse, and its adductor only was divided, and there is a relapse, let the patient look to his right. By this plan the inverting power of the left eye is

no doubt increased, but the mutual convergence is diminished, and the relapse may be cured. If both adductors were divided, in a case where the left eye was the worse, and there is a relapse, the patient should look to his left, by which means divergence will be produced as well as eversion of the worse eye.

3. If the case has been one of mutual divergent strabismus, and one or both abductors have been cut, the patient should avoid side-practice, and look at near and small objects, placed straight before him. This is *converging* practice, which is required also in cases of diplopia and eversion after division of one or both adductors. One of the best modes of using converging practice, is for the patient to look frequently at two reflected images, placed at the true concourse of the optic axes, as in the stereoscope.

16. *Ultimate good effects of the operation.* The ultimate good effects of the operation refer to the mobility of the eye, and the state of vision.

1. In successful cases, the distortion is permanently removed, the eye occupies its natural position in the orbit, the axes of the two eyes are parallel when distant objects are regarded, and converge equally, and in the proper degree, when the object is near. The motion of the eye is free and uncontrolled. If the case was one of convergent strabismus, the eye does not rest in the centre of the orbit, as perhaps it did immediately after the operation, but turns naturally to the nose. This movement of adduction is often quite perfect. It is effected by the re-united, or at least re-adherent, muscle, and by the innermost fibres of the levator and depressor.

2. For some time after the operation, the eye cannot be used with much freedom, and this the patient may confound with a new degree of weakness of sight. As the tenderness arising from the wound subsides, the vertex of the retina, which is its most sensitive part, is readily turned towards objects, and the range of vision is increased. A squinting eye often mars the vision of the straight eye, perhaps by the confusion arising from diplopia, perhaps by the kind of struggle as to which eye shall be directed on the object, so that the person sees better when the squinting eye is closed; when the operation has been successful in restoring the natural movements of the eye, he sees better with both his eyes open, than he did before when the squinting one was shut.

So far a decided improvement is effected, and this the patient is apt to mistake for an increase in the acuteness of vision. The fact is, there is never any immediate change in the visual power of the eye, as is ascertained by trying it with the letters of the same printed book with which it was tested before operation. The retinal power never suffers any diminution from the operation, unless in those rare cases where disorganising inflammation is produced; and in some instances, there follows a considerable improvement in vision. An increase in sensorial power is most likely to follow the operation, where the imperfection has been the effect of the strabismus, the sensibility of the retina having become blunted, and a sub-amaurotic state produced, by disuse. Careful examination shows, however, that the augmentation of sensorial power is seldom great, that it is much oftener fancied than real[57], and that, in general, it would be incorrect to attribute the improvement to any thing else than a return of the power of moving the eyes without restraint, and of directing both of them simultaneously upon objects. This sort of improvement, which is equivalent with the restoration of the very important function of single vision with two eyes, is often very striking, especially when the patient has been successfully operated on for the alternating variety of strabismus.

Patients with convergent strabismus are often myopic. But it would appear, that they sometimes suppose themselves so, merely from their being obliged to bring objects near to their face, in order to see them with both eyes together, so that the whole defect lies in want of ability to moderate the convergency of the optic axes. After the eyes are restored to parallelism by operation, such patients find that they are not myopic, but see at the ordinary distance.

Convergent strabismus may be so extreme, as to deprive the patient almost totally of the use of sight, till relieved by an operation; but cases of this kind should not be confounded with amaurosis. In a case operated on by Mr. Duffin[58], the patient was unable to turn the pupils sufficiently towards the centre of the orbit to expose the whole of the cornea to view. Both eyes were liberated by operation at the same sitting, but a considerable time elapsed before the pupils finally attained their proper position. They did so, however, in a considerable degree before the patient left the room. Mr. Duffin says, that "she was almost entirely amaurotic before the operation, and recovered her vision, so as to distinguish small objects, within an hour afterwards;" but the probability is, that there was nothing really amaurotic in a case where the recovery was so rapid.

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[1] Heuermann, in his "*Abhandlung der neuesten chirurgische Operationen*," published at Copenhagen and Leipsick in 1756, says, that Chevalier Taylor pretended to cure strabismus by a section of the tendon of the superior oblique.

In 1827-8, Mr. Anthony White, surgeon to the Westminster Hospital, frequently recommended, in his clinical observations, the operation of dividing the adductor muscle as an eligible surgical process, and looked out for squinting animals, in order that he might try the effect of the section first on them, before he should apply it to the human subject.

[2] Cavarra, Journal Hebdomadaire des Progrès des Sciences Médicales; Tome i. p. 309; Paris, 1836.

[3] Op. cit. pp. 310, 311.

[4] Dr. Cavarra mentions, that, if in a living animal, we divide the crus cerebelli, the animal immediately begins to squint. Division of the medullary part of the cerebellum, pons Varollii, or lateral part of the medulla oblongata, produces the same effect. If, instead of dividing, we compress the crus cerebelli of a living animal, strabismus, he says, is produced; and if the compression ceases, the eye recovers its natural powers of motion. The effect produced in such experiments is not so much strabismus, as luscitas from palsy.

[5] London Medical Gazette; Vol. xlv. p. 954.

[6] In illustration of the distinction between inversion or eversion and mutual convergence or divergence, I may mention the case of a patient at present under my care, who is almost blind of the right eye, in consequence of its having been struck with a potato some months ago. His left eye is incompletely amaurotic, so that he cannot read with it. The left side of his face is slightly paralytic. When he regards an object straight before him, he keeps his eyes turned to the right, so that the right eye is everted and the left inverted; but he can turn them to the left, and in this movement their pupils continue at the same distance from one another, so that their axes are parallel. On closing his eyes and suddenly opening the right, it is always everted; on suddenly opening the left, it is always inverted. On shutting the left eye, the right becomes central; on shutting the right, the left remains inverted, but on moving the object sinistrad the eye becomes central, showing the vertex of the retina to be com-

paratively insensible. The left eye, therefore, looks sideways at objects; the right eye does not look at all, but obeys the association of motion. When the left eye is closed, the right occupies its normal place, and uses the little sight it has; but this it does only when the left eye is shut. As the eyes are parallel in this case, there is no strabismus. If, by bandaging the left eye and exercising the right, the right could be made to see better than the left, the patient would look in the natural way.

[7] Lancet, September 19. 1840, p. 928. Ib., October. 31 1840, p. 192: Ib. December 5. 1840, p. 386: Edinburgh Medical and Surgical Journal, Vol. lv. p. 370; Edinburgh, 1841.

[8] Lucas' Practical Treatise on the Cure of Strabismus, p. 48; London, 1840.

[9] Duffin's Practical Remarks on the New Operation for the Cure of Strabismus, p. 62; London, 1840.

[10] Collections from the unpublished Medical Writings of C. H. Parry, M. D., p. 571; London, 1825.

[11] Commentaries on some of the Diseases of Children; Part i. p. 127; London, 1815.

[12] Parry, Op. cit. p. 572.

[13] London Medical Gazette, Vol. xxvii. p. 642.

[14] Boyer, Traité des Maladies Chirurgicales; Tome v. p. 607; Paris, 1816.

[15] Pflege gesunder und geschwächter Augen, p. 41; Frankfurt, 1802.

[16] The goggles mentioned in the text are to be had of Mr. Alexander, Optician, Exeter.

[17] Smith's Complete System of Opticks; Remarks, p. 31; Cambridge, 1738.

[18] Dissertation sur la Cause du Strabisme; Mémoires de l'Académie Royale des Sciences, pour 1743, p. 338; 12mo; Amsterdam, 1748.

[19] Medical Times and Gazette; August 27, 1853, p. 216.

[20] Op. cit. p. 312.

[21] Recueil de Mémoires et d'Observations, p. 410; Montpellier, 1783.

[22] Philosophical Transactions for 1778; Vol. lxvii. Part i. p. 86.

[23] From a series of experiments which he afterwards made, he came to the conclusion that the insensible spot at the bottom of this child's eye was four times the area of that in the eyes of others.

[24] Krankheiten des menschlichen Auges, p. 234; Berlin, 1819.

[25] Dieffenbach's Operative Chirurgie; Vol. ii. p. 166; Leipzig, 1848.

[26] Beiträge zur operativen Orthopädik; p. 22; Hanover, 1833.

[27] Ammon's Monatsschrift für Medicin, Augenheilkunde und Chirurgie; vol. iii. p. 321; Leipzig, 1840.

[28] Duffin, Op. cit. p. 78.

[29] Clay, Lancet, January 2. 1841, p. 496.

[30] Hall, London Medical Gazette, Vol. xxvii. p. 284.

[31] London Medical Gazette, Vol. xxviii. p. 37.

[32] Die Behandlung des Schielens durch den Muskelschnitt, p. 6; Leipzig, 1840.

[33] Edinburgh Medical and Surgical Journal, Vol. lv. p. 376.

[34] Lucas, Op. cit. p. 73.

[35] It is well known that, when we look at an object straight before us, the pupil is not in the centre even of the aperture of the eyelids, much less of the orbit. The phrase *centre of the orbit* is used for the sake of brevity, though not strictly correct.

[36] Summary of seventy-six Operations by Mr. Liston; Lancet, July 18. 1840, p. 610.

[37] Franz, London Medical Gazette, Vol. xxvi. p. 690.

[38] Lietch, Edinburgh Monthly Journal of Medical Science; Vol. i. p. 171; Edinburgh, 1841.

[39] Dublin Journal of Medical Science; Nov., 1845; p. 210.

[40] Lietch, Op. cit. p. 178.

[41] Op. cit. pp. 100, 104.

[42] In a boy, of hæmorrhagic diathesis, whose life had been in danger several times from hæmorrhage after slight injuries, and who was operated on by Mr. Lane, the bleeding continued, with occasional intermissions, for six days and five nights, in spite of the usual remedies, both general and local. The prostration was so great that transfusion was had recourse to, and with success. Lancet, October 31. 1840, p. 185.

[43] Lucas, London Medical Gazette, Vol. xxvii. p. 73.

[44] Duffin, Op. cit. p. 43.

[45] Ammon, Op. cit. p. 16.

[46] Lucas, Op. cit. p. 58: Dieffenbach über das Schielen, p. 107; Berlin, 1842.

[47] Franz, London Medical Gazette; Vol. xxvii. p. 41.

[48] Dieffenbach, Op. cit. p. 98.

[49] Ibid. p. 101.

[50] Ibid. p. 98: Ammon, Op. cit. p. 15.

[51] Commentarii Academiæ Petropolitanæ, Tom. i. p. 304; Petropoli, 1728.

[52] Op. cit. p. 83.

[53] London Medical Gazette; Vol. xxvii. p. 654.

[54] Report on the Result of the Operations for the Cure of Squinting, performed at the Royal Westminster Ophthalmic Hospital, between the 18th April and 30th October, 1840; p. 11; London, 1840.

[55] Op. cit. p. 25.

[56] *Orthophthalmic*, from ὀρθὸς, *straight*, and ὀφθαλμὸς, *eye*.

[57] Sir Charles Bell's Practical Essays, pp. 77, 78. 82; Edinburgh, 1841.

[58] Op. cit. p. 46.

SECTION V.—LUSCITAS, OR IMMOVABLE DISTORTION OF THE EYEBALL.

From luscus, *blind of an eye.* *Syn.* — Strabismus passivus.

The word *luscitas* has been used in various senses by authors on the diseases of the eye. Plenck employs[1] it as synonymous with oblique vision, or that state of the eyes in which the patient, seeing little or nothing when he looks directly forwards, perceives objects situated to one side, but without any distortion of the eye; while Beer understands[2] by luscitas, that the eye is turned to one or other side, and is there completely fixed, so that the patient is unable to move it. Luscitas, in this sense, is often confounded with strabismus; but in the latter affection, the patient is able to move the distorted eye, so as to direct it upon any object as soon as he closes the sound eye, while to effect the same purpose in luscitas, he must, as the eye is fixed, rotate the head.

Causes. Palsy of the rectus internus, attended generally by a similar affection of the rectus superior, rectus inferior, and levator palpebræ superioris, while the rectus externus retains its power, and rolls the eye outwards, is the most frequent cause of immovable distortion. Palsy of the abductor, again, will cause luscitas towards the nose. Injuries of the head, and affections of the brain, by causing palsy of one or other of the recti, may produce luscitas. Thus, in chronic hydrocephalus, I have seen both eyes turned to the right, the patient having entirely lost the power of moving them to the left. I was consulted in a case of luscitas of the right eye, the left being amaurotic. The luscitas had been preceded by exophthalmos and palsy of the right side of the face, but these symptoms had subsided. The right eye was turned completely into the inner canthus, and no effort of the patient, or pressure of the finger, could move it. In this state, the patient saw to work as a weaver. Injuries of the muscles of the eyeball, or of their nerves, or matting together of the orbital cellular substance from inflammation, may produce luscitas; also the pressure of tumours within the orbit, or a congenital deficiency of one of the recti.[3]

Prognosis. Luscitas is often incurable. The turning of the eye outwards or inwards, in palsy of the muscles, may cease, and the eye be again directed forwards, merely in consequence of the palsy extending to the rectus externus or internus. If the palsy be cured, not merely will the luscitas cease, but the natural movements of the eye be restored.

Treatment. Except in cases of injury of the muscles, or their nerves, and of orbital tumours, the general treatment of luscitas is that already recommended for palsy of the muscles of the eyeball. Dieffenbach[4] recommends cauterization with nitrate of silver over the palsied muscle, excision of a fold of conjunctiva in the same situation, and division of the opposite muscle. Cauterization excites the weak muscle, and produces a contraction of the conjunctiva. Excision draws the eye towards the proper direction, by means of the cicatrice which follows. Division of the opposite muscle allows the eye to approach the central position.

[1] Doctrina de Morbis Oculorum, p. 214; Viennæ, 1777.

[2] Lehre von den Augenkrankheiten; Vol. ii. p. 667; Wien, 1817.

[3] See Schön's Handbuch der Pathologischen Anatomie des menschlischen Auges, p. 64; Hamburgh, 1828.

[4] Die Operative Chirurgie; Vol. ii. p. 166; Leipzig, 1848.

SECTION VI.—TETANUS OCULI.

A fixed state of the eyeball, from tonic spasm of all, or several, of the recti, is styled tetanus oculi.

The state of the eyes and eyelids in trismus and tetanus merits greater attention than has been bestowed on it.

In a case of trismus related[1] by Mr. Harkness, the patient, after stiffness in his jaw, which was the first symptom, felt stiffness and weight in the eyelids, which prevented him from opening them readily. He had also a slight degree of dimness, and a want of power over the ball of the eye, which remained, according to his sensations, fixed in his head, and was slightly drawn inwards. The eyelids were for three or four days much swollen.

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[1] Medico-Chirurgical Transactions; Vol. ii. p. 286; London, 1813.

SECTION VII.—OSCILLATION OF THE EYEBALL.

Syn.—Resolutio oculorum, *Celsus.*

Symptoms. In oscillation, the eyeball is affected with an almost perpetual motion; sometimes rotatory, as if on its antero-posterior axis; in other cases, circumductory. The latter is effected by consecutive contractions of the recti; the former, by alternate contractions of the obliqui. The libratory or controlling actions of all the muscles seem weakened, so that the eye is affected with a sort of paralysis agitans. The patient is in general not conscious of the abdormal motions, from any particular feeling which he has in the eyes, nor can he restrain them. They go on even when the lids are closed, but cease during sleep. The rotatory motion varies in extent, from a scarcely perceptible degree, to perhaps nearly a quadrant. In some cases, the motion seems to be rather from side to side, but often so small in degree and so rapid, that it is difficult to say what is exactly its direction.

Patients affected with partial amaurosis often complain of all objects appearing to them in a state of tremor. In such cases, we naturally expect to find the eyeballs oscillatory; but very often no oscillation can be detected, so that we are led to refer the apparent tremor to some peculiar morbid state of the retina or internal optic apparatus. On the other hand, those who are affected with oscillation, generally, though not always, make mention of an apparent unsteadiness and tremor of objects. I have known a patient with this disease complain of great deficiency of sight, from an apparent waving of all objects up and down. In another case, the oscillatory movement was very marked, so long as the eyes were directed towards any object; but when I held up the upper lid of one eye, and desired the patient to shut the other eye, the oscillation instantly and totally ceased, and the pupil turned up under the lid. To this patient all objects appeared tremulous, and from this cause, along with a degree of amaurosis, very indistinct. The pupils were large, and the aqueous humour superabundant. The case had all along been regarded as one of mere myopia. In another case, I observed that the oscillation ceased whenever the patient looked down, but became very great whenever she looked up. Convergence of the eyes, as in reading, seemed in this case to remove the oscillation. When both eyes were open, the oscillation was striking; but if one eye was closed, the other became perfectly steady, there being in this respect some analogy to strabismus.

Oscillation is often attended by short-sightedness, generally by asthenopia, and a sensation of weariness in the eyes, sometimes by tremulousness of the iris, and pain deep in the orbits, and in the head. Oscillation occasionally accompanies strabismus.

It is surprising how little, in some cases, oscillation disturbs vision. For instance, a girl of 17, whose case is recorded[1] by Sir Charles Bell, read with perfect ease, and yet there was no cessation of the motion of the eye. She threaded her needle, without any apparent difficulty, and then showed how she could sew, which was with the usual nimbleness. All objects seemed to this patient in their natural state of rest, or of motion. When she looked at herself in the glass, she saw her eye rapidly moving.

Causes. A congenital want of pigmentum nigrum, as in the albino, is generally attended by oscillation. We generally observe this symptom in congenital cataract, and it becomes more marked as the patient advances in years; hence a reason for operating early in such cases. It also often attends congenital amaurosis, complete or incomplete, as well as the loss of vision, which follows deep-seated scrofulous inflammation of the eyeball. I have seen oscillation, with alternating strabismus convergens, follow ophthalmia neonatorum. Fatiguing employments of the sight always increase this unsteadiness of the eyes; while it generally subsides after a period of rest. In one instance, I observed oscillation of both eyes attendant on apoplexy, along with palsy of the left side of the body, diminished power of the right abductor oculi, and a degree of amaurosis. Dr. Wallace mentions[2] a case in which an incessant motion of the eyes, resembling those of a child with congenital cataract, was brought on by overdosing with hydriodate of potash.

Treatment. Even in the most favourable cases of congenital cataract attended by oscillation, this symptom diminishes very slowly after the pupil becomes clear, from the removal of the opaque lens. If incomplete amaurosis has accompanied the cataract, the oscillation continues unchanged. In cases of oscillation attending incomplete amaurosis, and accompanied by pain deep behind the eyes, the occasional application of leeches to the temple relieves the pain, and lessens the oscillation. I have known a gradual improvement take place in congenital cases, much beyond expectation. Rest of the eyes, and a course of tonic medicines, are indicated in most other cases of oscillation; but, it must be confessed, they are rarely productive of a permanent or complete cure.

Dieffenbach and others[3] have divided, sometimes the rectus internus and externus, sometimes the obliqui, with the view of relieving oscillation; but, on the whole, the results have not been encouraging.

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[1] Nervous System of the Human Body; Appendix, p. xlii.; London, 1830.

[2] Lancet, 26. March, 1836, p. 9.

[3] Dieffenbach über das Schielen, p. 199; Berlin, 1842: Chelius, Handbuch der Augenheilkunde; Vol. i. p. 394; Stuttgart, 1843.

SECTION VIII.—NYSTAGMUS.

From *νευστάζω, I nod.*

This term is used to signify an involuntary motion of the eyeball from side to side. It is a clonic convulsion of the recti, symptomatic of various nervous diseases, as hysteria, epilepsy, chorea, &c. In a case of compressed brain, from effused blood, attendant on fractured skull, I saw this pendulum-like movement of the eyes continue for some hours before death. It went on uninterruptedly, even with the lids shut. Dr. Bright[1] describes nystagmus as attendant on cerebral pressure, in a case of suffocation from the fumes of burning coals.

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[1] Report of Medical Cases; Vol. ii. p. 226; London, 1831.

CHAPTER XII.

INJURIES OF THE EYEBALL.

In the first and second Sections of Chapter IV. we have considered injuries of the muco-cutaneous membrane, which covers the anterior surface of the eyeball. We have now to turn our attention to those implicating the proper textures of the organ; and here I shall take the opportunity, before entering on the enumeration of the particular injuries which we are so frequently called on to treat, to warn practitioners against the neglect of depletion, and especially the neglect of general blood-letting, in cases of injury of the eye. The smallness and apparent slightness of such injuries are apt to lead to inattention, of which total loss of sight may be the result. Other remedies are no doubt necessary, both local and general, such as mercury where internal inflammation threatens; but this, as well as ocal means, is not so apt to be overlooked as the taking away of blood from the system. Many cases have occurred in my practice, n which vision, lost for weeks, has been speedily regained by veneection.

SECTION I. — INJURIES OF THE CORNEA.

§ 1. *Contusion of the Cornea.*

Foreign bodies, of small bulk, impinging with violence against the cornea, and immediately flying off, sometimes produce very severe inflammation, ending in ulceration of the part struck, infiltration of matter between the lamellæ of the cornea, and other dangerous effects. The cornea is sometimes permanently misshapen after a blow. I have never seen this, however, except in cases where at the same time the lens was dislocated.

§ 2. *Foreign Substances imbedded in the Cornea.*

It is a common occurrence for minute, hard, angular, and sometimes ignited particles, to be projected with such force as to penetrate, not merely through the epithelium, but through the anterior elastic lamina, of the cornea, and into its proper substance; for instance, a chip of steel, a spark from the anvil, a minute fragment of stone, a splinter of wood, or a particle of glass. Imbedded within the cornea, a small foreign body of this description does not produce so constant a flow of tears, so much spasm of the orbicularis palpebrarum, nor such speedy inflammation of the external tunics of the eye, as it would do, were it fixed on the external surface of the cornea.

Generally, in a few hours after the extraneous substance is imbedded in the cornea, the adjacent portion becomes hazy and opaque, the opacity extending according to the violence of the inflammatory symptoms which succeed. The conjunctiva and sclerotica around the cornea redden, and the pain is varied in kind, and more or less severe, according as the one or the other of these tunics is chiefly affected with inflammation. If the conjunctiva is the chief seat of the increased vascularity, the patient feels as if the eye were filled with sand; if there is considerable sclerotitis, pulsatory circumorbital pain is excited. Inflammation of the iris may even be brought on, ending in effusion into the pupil, especially if there already exist a predisposition to iritis, or an inflammatory tendency be present in the constitution. In the mean time, the part covering and in contact with the foreign body, killed perhaps by the impetus with which it was struck, or scarred by the ignited state of the particle, is gradually reduced to the state of a slough, which being loosened by the processes of ulceration and suppuration, at length drops out along with the foreign substance. An ulcer of the cornea is thus left, more or less deep, which in general heals up readily, leaving a leucoma or opaque cicatrice. If the foreign body be an unignited particle of iron, and be allowed to remain till it becomes oxidized, a brown speck is produced by the detention of the oxide in the substance of the cornea. (See p. 230.)

Occasionally it happens that the inflammation of the cornea is very severe, and gives rise to infiltration of matter between its lamellæ. The foreign body being removed, and the inflammation abated by antiphlogistic means, the matter is generally absorbed; but if the case is still neglected, the purulent effusion may increase, hypopium may be added to the onyx which already exists, and the eye will, in all probability, be destroyed. This result is particularly apt to follow, when rude attempts are made by common work-people to remove particles of whinstone and iron, imbedded in the cornea. From the journals of the Glasgow Eye Infirmary, I could quote several lamentable cases of this sort, in which a conceited mechanic, having attempted, with a common penknife, the removal of foreign substances from the cornea, violent inflammation followed, ending in extensive ulceration, onyx, hypopium, staphyloma, and of course entire loss of vision.

It is sometimes the case, after a foreign body has lain imbedded for a time in the cornea, that a layer of new substance is formed over it, so that the inflammation at first excited by its presence ceases, and it remains through life, without giving rise to any farther irritation. I have frequently seen this happen to grains of gunpowder and sometimes to particles of coal driven into the cornea by explosions in the fire.

In other cases, the shape of the foreign substance, or the manner in which it is fixed in the cornea, may prevent it from either dropping out, or becoming invested in the manner now mentioned; it will continue, therefore, to produce irritation and inflammation, which may prove destructive to vision. I shall have occasion, under the head of *Penetrating Wounds of the Cornea*, to quote a case which occurred in Mr. Wardrop's practice, which will illustrate this point.

When we proceed to remove a foreign particle imbedded in the cornea, we are directed to bandage up the sound eye, or close it with the fingers; but it often proves of advantage in fixing the injured eye, for the patient to direct the opposite one towards some object placed before him. The patient being seated in a good light, the assistant, standing behind him, supports the head, raises the upper eyelid, and prevents the eyeball from rolling upwards. If no assistant be at hand, we may fix the head of the patient against the wall, or lay him on a table and separate the lids with the fingers of the hand which does not hold the instrument with which the foreign particle is to be removed. Adams' speculum may be used with advantage, for elevating the upper lid, and fixing the eyeball. If an assistant be present, and the eye still continues restless, the conjunctiva of the globe may be seized with forceps. If this be done with dexterity, the eye is rendered quite quiet. If extremely irritable, the patient may be put under the influence of chloroform.

When merely fixed in the anterior elastic lamina, and not beneath it, foreign particles may sometimes be removed from the cornea with the edge of the small silver spatula. (See *Fig.* 31, p. 230.) If more deeply imbedded, the point of a cutting instrument, such as a cataract needle or knife, must be used for dislodging the offending body. This is not accomplished, in many cases, without fairly passing the point of the instrument under the particle of iron or stone, so as to lift it out of the cornea; and so firmly is the foreign body grasped in many cases, that even this plan will not succeed, unless the portion of the cornea external to the foreign particle is first fairly divided, and then pressure applied in the way described.

Dr. Jeanneret proposes the removal of iron spiculæ from the cornea, by keeping the eye open in a wine-glassful of a solution of from 1 to 3 grains of sulphate of copper in an ounce of water.[1]

Dr. Jacob tells us, that when he meets with a case in which a particle of iron has been allowed to remain until it has produced a stained ulcer, he scrapes the surface with the point of the needle, after removing the foreign body, in order to prevent any permanent stain.[2] Autenrieth, after the foreign body is removed, proposes to dissolve the remaining rust with diluted muriatic acid.[3] Ammon in such cases removes both the foreign body, and a minute portion of the external lamellæ of the cornea, with the extraction knife.[4] These three modes of practice appear highly objectionable. When the patient does not present himself till some days after the accident, the surgeon must examine the part carefully, both throwing the light upon it with a lens, and looking at it through the ophthalmic microscope, to ascertain whether the foreign body be still present, as he may otherwise be deceived by the brown oxide adhering to the spot. The brown spot will generally separate of itself and drop off, in eight or ten days.

When the extraneous body is removed by art, it leaves a depression in the cornea, which in general is soon filled up, and the surrounding opacity is gradually removed. It is often the case that, in removing foreign particles fixed in the cornea, a considerable portion of its epithelium is abraded; but this is reproduced perfectly transparent, unless acetate of lead in solution is afterwards used, as it too often is, for bathing the eye. This application renders the cicatrice opaque.

The eye should be fomented three or four times a day, with warm water, and the eyelids painted over with extract of belladonna. This greatly relieves the intolerance of light attendant on every sort of abrasion or ulceration of the cornea. Bleeding with leeches, or from a vein of the arm, is highly beneficial, and must on no account be neglected when much irritation has been produced; the patient should be purged, and should remain at rest, without attempting to use the eyes, till all danger of inflammation is past. When a deep ulcer of the cornea has formed in consequence of such injuries as we have now been considering, evacuation of the aqueous humour is one of the remedies which act most beneficially.

§ 3. *Punctured Wounds of the Cornea.*

Punctured wounds of the cornea, even when they do not penetrate, must be watched with great care, as the inflammation which follows is sometimes rapidly destructive. I have seen a prick with a needle produce, in the course of a few days, during which the case was neglected, such a degree of inflammation, as ended in a copious deposition of lymph and pus between the lamellæ of the cornea, and in the anterior chamber. Bleeding at the arm, the liberal application of leeches, purgatives, rest, and a strict antiphlogistic regimen, will be required. Against the inflammation of the iris, which is apt to arise, and end, if neglected, in closure of the pupil, calomel with opium internally, and belladonna externally, are to be employed.

§ 4. *Incised Wounds of the Cornea.*

We meet with incised wounds, which implicate little more than the anterior elastic lamina of the cornea. Such a wound causes for a time diplopia of the affected eye. The edges of such a wound swell and gape: there is a fear sometimes that it may ulcerate and form a perforation through the cornea; but it in general contracts gradually, and heals, leaving a linear cicatrice. I have known such an injury, inflicted with the point of a scissors, prove the cause of asthenopia.

§ 5. *Penetrating Wounds of the Cornea — Loss of the Aqueous Humour — Prolapsus of the Iris — Fistula of the Cornea — Ophthalmitis and other Effects of Wounds of the Cornea.*

As the wounds which penetrate through the cornea into the anterior chamber, vary much in their nature, being either clean-incised or lacerated; in their extent, from a mere puncture to the whole breadth of the cornea; and in their situation, being sometimes at the edge, and in other cases near the centre of the cornea: so their effects are very different in different instances. We meet with penetrating wounds of the cornea, so small and so oblique, that they give rise to no discharge of aqueous humour, and heal by the first intention, leaving scarcely any cicatrice; in other cases, the wound, for weeks, permits the aqueous humour to ooze through it, but at length unites, and perhaps leaves the eye without any serious permanent defect; while in a third set, the wound inflames, suppurates, and leaves an opaque cicatrice, which interferes more or less with vision, according to its situation and extent. We sometimes find that the irregularity of the cornea at the wounded part, independently of opacity, gives rise to considerable obscurity of sight, and occasionally to double vision when objects are regarded with the injured eye singly. While wounds with clean cutting instruments are much less dangerous, those inflicted with thick and irregular bodies, such as a nail, a packing needle, or the prong of a fork, may cause great opacity, with swelling and suppuration of the cornea in less than 24 hours. Such cases, after a continuance of violent inflammation, are apt to end in atrophy of the eye.

In nine cases out of ten, penetrating wounds of the cornea are followed by the instantaneous escape of a considerable portion of aqueous humour, and a protrusion of the iris. The latter consequence is much more apt to occur, if the opening in the cornea is situated near its edge. The prolapsus results partly from the iris losing the support of the aqueous humour which has been evacuated, partly from the push made by the rest of that fluid to escape also by the wound. The pupil is dragged towards the prolapsed portion of iris, and, as but too often the prolapsus remains unreduced, the iris unites to the lips of the wound, and the deformity is permanent. The lens being wounded in many of those cases, cataract is observed as soon as the state of the cornea permits the interior of the eye to be seen. Such is often the result when children wound their eyes with such bodies as a penknife, fork, pair of scissors, or bit of glass.

The loss of the aqueous humour, although regarded by the ancients as equivalent to the loss of vision, is speedily repaired by the re-secretion of that fluid. The replacement of the prolapsed iris is a matter of much greater difficulty. It is often impossible to effect this replacement. Mr. Lawrence states he has never seen it accomplished.[5] We may, however, occasionally succeed, by the following means, if they be employed within an hour or two after the accident, and especially if it is the pupillary portion of the iris which is prolapsed:—

The first thing to be done is, to produce as much contraction as possible of the radiating fibres of the iris, by belladonna. This is best effected by dropping into both eyes a solution of 3 or 4 grains of atropine in an ounce of water. The sound pupil expanding, helps by sympathy to dilate that of the wounded eye. If atropine is not at hand, extract of belladonna, diffused in water, must be used in the same way, and also smeared upon the eyelids.

The next thing is, to place the patient under the influence of chloroform. This not only aids in dilating the pupils, but obviates entirely any resistance or restlessness on the part of the patient, during our attempts to replace the prolapsed iris. We probably find the eye already inflamed, intolerant of light, and acutely painful. The cornea will, in general, be more or less flaccid; and, on attempting to fix the eye, there is apt to follow a further discharge of aqueous humour. These symptoms are moderated by the influence of the chloroform.

The patient being placed in the horizontal position, we next have recourse to friction of the eye through the upper eyelid, continued for some minutes, and then sudden exposure of the eye to a bright light. This is a means which must not be hastily abandoned, but tried repeatedly, patiently, and for several minutes at a time. The object is to press back the protruding iris through the wound of the cornea, by moving the eyelid circularly over the surface of the eyeball. If this does not succeed, we should endeavour, with the curette or a small blunt probe, so to press upon the protruding portion of iris, that the aqueous humour contained behind it is dislodged. If this is effected, we may have the satisfaction of seeing the iris slip back into its place.

In the course of from 15 to 30 minutes, the atropine or belladonna will have probably operated on the unprolapsed portion of the iris, so as to dilate that portion of the pupil which is free, and perhaps to drag back into its natural place the prolapsed portion. If the prolapsus still continues, our attempts by friction, and with the curette or probe, are now to be renewed. If we are successful, it is recommended that the wound be touched with a sharp pencil of lunar caustic, which serves to prevent any further discharge of the aqueous humour.[6]

If the prolapsus of the iris, notwithstanding the action of the atropine or belladonna, and our attempts to replace it with the curette or probe, still continues unreduced, it ought to be punctured, or a snip made in it with the point of a pair of fine scissors. This allows the aqueous humour which lies behind the prolapsed portion to escape, and favours the return of the iris into its natural situation, which we must now endeavour to accomplish by the means already indicated.[7]

Should all our attempts to reduce the prolapsed portion of iris fail, we have still a choice left of snipping it off with the scissors, or of leaving it slowly to contract and disappear. The former is certainly the preferable practice; for if left to itself, it long proves a cause of irritation. It for a time increases in size, instead of diminishing, and thereby drags the pupil more to one side, and leaves a broader cicatrice than if it had been excised. If the patient refuses to permit this to be done, the prolapsed portion may be touched every second day with nitras argenti. Under this treatment it adheres to the cornea, gradually shrinks, becomes covered with a lymphatic effusion, and at length disappears, the pupil being left permanently disfigured, and vision more or less abridged, according to the size and situation of the cicatrice.

Very extensive divisions of the cornea are less liable to be attended with prolapsus of the iris, than those which are more limited. Thus, the section of the cornea in extraction of the cataract is rarely followed by immediate prolapsus, while a quarter-section, such as is made in forming an artificial pupil by excision, generally produces a protrusion of the iris. The same holds with regard to accidental wounds. The cornea has been known to be divided completely across by a sharp instrument, without any prolapsus of the iris, and to be cured with only a slight linear cicatrice.[8] In cases, however, of complete diametral division of the cornea, with a penknife, piece of glass, &c. very frequently the iris, though it has not prolapsed, unites to the cornea, and the lens, having been touched, is rendered opaque.[9]

The penetrating wounds of the cornea, of which we have been speaking, are those made by foreign substances which are immediately withdrawn, as the point of a penknife, fork, or pair of scissors, sharp pieces of wire or wood, splinters of metal or stone projected against the eye, and the like. It sometimes happens, however, that the body with which the injury is inflicted, is left sticking in the cornea.

Case 244.— On the 29th June, 1843, I was raised out of bed at 2 A. M., to extract a fishing-hook from a man's cornea, where it had been fixed since the previous evening about 8 o'clock. The point of the hook had penetrated into the anterior chamber, and the barb was covered in the substance of the cornea. By seizing it firmly with a pair of forceps and drawing it steadily, I managed to make it retrace its path, which I scarcely expected to have done without enlarging the wound. Next day, the eye looked well; but the iris, from the escape of aqueous humour, was in contact with the cornea. I dilated the pupil by belladonna, and in two days the eye was perfectly well.

I have referred at page 387 to the following instance: —

Case 245.—A patient applied at Mr. Wardrop's hospital, with considerable redness of the left eye, and great intolerance of light. On the temporal edge of the cornea there was an opaque spot, to which the pupil, which was irregular, adhered. Fourteen weeks before, when twisting a piece of gold wire, a small portion of it broke off and struck the eye. Three days after the accident, intense inflammation came on, with severe pain, which continued for five weeks, and resisted active depletion. From this period, the pain became less acute. A few days after applying at the hospital, a portion of gold wire was observed projecting beyond the surface of the cornea, and a considerable portion seemed to be impacted in the opaque spot. It was easily extricated by means of a pair of forceps, and was followed by a discharge of the aqueous humour. The portion of wire was fully 3 lines in length, and one extremity had penetrated into the anterior chamber. The patient felt much relieved immediately after the extraction of the foreign substance, and the inflammation and opacity soon subsided.[10]

It sometimes happens that a perforating wound of the cornea, close to the edge of the sclerotica, and entering the anterior chamber, becomes closed by the conjunctiva healing over it, although the proper substance of the cornea does not heal, so that the aqueous humour flows out through the opening in the cornea, and elevates the conjunctiva in the form of a vesicle. If this swelling be removed with the scissors, a large quantity of thin fluid escapes, and at the bottom of the cavity which has thus been laid open, an orifice will be detected, leading into the anterior chamber. If nothing further is done, the conjunctiva heals, but the *fistula corneæ,* as it is termed, remains, and the vesicular swelling returns. To close the fistulous aperture it is necessary, after snipping off the conjunctiva, to touch the orifice in the cornea with a pointed lunar caustic pencil.[11]

Wounds of the cornea, with chips of iron or stone, sent with great force against the eye, and implicating perhaps the iris and the lens, are apt to be followed by phlegmonous ophthalmitis. If the cornea and sclerotica are wounded at their junction, the iris protrudes, the pupil is dragged towards the wound, and, after the wound has healed, sympathetic inflammation of the opposite eye is apt to ensue. The division of parts in a wound of the eye may be confined to the cornea; but the effects of the injury may spread to the interior of the eye, as in the following case: —

Case 246. — A wound of the cornea, with a chip of iron, caused considerable inflammation of the conjunctiva and sclerotica, great muddiness of the anterior chamber from effused lymph, and a gold-green colour of the iris. As the anterior chamber cleared, lymph was seen deposited on the crystalline capsule; this was gradually absorbed, and the lens was seen to be transparent; but behind it there was an opaque concave appearance of a yellowish-green colour, probably from lymph effused on the surface of the retina. The eye retained a mere perception of light and shade.

In a case, reported by Mr. Pollock, the violent inflammation resulting from the cornea being cut across by a stroke with a whip, was followed by fatal tetanus.[12]

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[1] Medical Times and Gazette; April 24. 1852, p. 428.

[2] Dublin Hospital Reports; Vol. v. p. 372; Dublin, 1830.

[3] Zeitschrift für die Ophthalmologie; Vol. ii. p. 332; Dresden, 1832.

[4] Ibid., p. 331.

[5] Lectures in the Lancet; Vol. x. p. 482; London, 1826.

[6] See case of prolapsus iridis, successfully treated by Dr. Macfarlane; Glasgow Medical Journal, Vol. i. p. 104; Glasgow, 1828.

[7] Gibson's Practical Observations on the Formation of an Artificial Pupil, p. 42; London, 1811.

[8] Rognetta, Cours Public d'Ophthalmologie; Lancette Française, 7 Janv. 1837.

[9] Demours, Traité des Maladies des Yeux, Pl. 53; Paris, 1818.

[10] Lancet; Vol. x. p. 475; London, 1826.

[11] Medical Gazette; Vol. v. p. 224; London, 1829.

[12] Medical Gazette; Vol. xxxix. p. 1006; London, 1847.

SECTION II.—FOREIGN BODIES IN THE AQUEOUS CHAMBERS.

In many instances of penetrating wound of the cornea, the foreign body enters completely into the anterior chamber. We sometimes find that it is adhering to the inner surface of the cornea, or that it has fallen to the bottom of the anterior chamber; more frequently, that it is fixed in the iris or in the capsule of the lens; rarely, that it has passed behind the iris so as to lie in the posterior chamber. In all these cases we proceed immediately to its removal, unless it be of very small size. A grain of gunpowder, for example, which, having passed through the cornea, is fixed on the anterior surface of the iris, or perhaps even a particle of metal of the same size, we should allow to remain. It has repeatedly happened that the point of a cataract knife or needle, breaking off in the anterior chamber, has been left there, and has become oxidized and dissolved.[1] We cannot calculate on the removal of larger and rougher metallic fragments in this manner. If they are fixed in the iris, or if they are impacted between the cornea and the iris, although without any laceration of the latter, they will almost certainly bring on iritis; and even if merely in contact with the crystalline capsule, cataract is the invariable result. Remove a metallic fragment from these several situations, and iritis and cataract may be prevented. In doing this, however, there is a danger of wounding the iris, of tearing it from the choroid, with effusion of blood, of opening the capsule, so as to admit the aqueous humour into contact with the lens, which will cause cataract, of the iris prolapsing after the foreign body is removed, and of disorganizing inflammation from the operation, ending in atrophy of the eye.

The difficulty of removing a foreign body depends much on whether it is free in the aqueous humour, impacted between the cornea and iris or lens, or actually fixed by its angles or extremities in the substance of one or other of these structures.

Great advantage is obtained, when we are about to proceed to the extraction of such bodies, by placing the patient in the horizontal position, and bringing him fully under the influence of chloroform. If this is not done, but the patient is seated, his head should lean against the breast of an assistant, standing behind him; and if the eye is unsteady, the conjunctiva, near the inner canthus, should be seized with a pair of forceps.

The extraction of a foreign body from the anterior chamber may sometimes be accomplished by means of a hook, or a small pair of forceps (smaller than that represented in *fig.* 28, page 219), introduced through the wound of the cornea already present, or through an enlargement of the wound effected with the cataract knife; but in other cases, either this cannot be done, or it would be improper to attempt it, and we must make a new and sufficient opening with the cataract knife, about the 10th of an inch from the edge of the sclerotica. If the incision be made closer to the sclerotica than this, protrusion of the iris is more likely to occur. I have seen the application of belladonna, in a case in which an angular fragment of steel was impacted between the iris and the cornea, dilate the pupil and carry the foreign body along with the iris to the very edge of the cornea; but I do not consider this as a practice to be generally followed preparatory to extracting the foreign substance by an incision of the cornea, as I think it favours prolapsus of the iris. Not unfrequently it happens that as soon as the incision is made through the cornea, the foreign body is forced out along with the aqueous humour, so that we are saved from any trouble of extracting it with instruments. A common forceps, to act within the anterior chamber, requires a pretty large incision; a smaller one suffices for the introduction and working of a blunt hook, the guarded hook of Schlagintweit, or the canula-forceps.

Case 247. — While a workman was chipping brass, a sharp fragment of that substance, about 1½ line long, was projected into one of his eyes. Twelve days after the accident, he came to me, when I found the bit of brass adhering to the internal surface of the cornea. There was no visible wound or cicatrice, but a considerable degree of iritis was present. I bled him at the arm, put him on calomel and opium, and dilated the pupil with belladonna. By these means, the inflammation and pain of the eye were reduced, and I proceeded to extract the foreign body. At the distance of the 10th of an inch from the sclerotica, I opened the cornea to the extent of fully more than two lines, taking care to keep the knife in the wound till some of the aqueous humour had oozed out, thus preventing a prolapsus of the iris, which is very apt to follow the sudden discharge of that fluid. I next introduced a small hook, and drew the bit of brass along the surface of the cornea, till it reached the wound, through which it was readily extracted. In a few days the eye was perfectly well.

Case 248.—A man came to me with a thorn in his eye. The point of it was fixed in the iris, and its thicker extremity in the cornea. The accident had happened three weeks before, and the wound of the cornea by which the thorn had entered, was healed over. During these three weeks, the presence of the thorn had caused no inflammation, and very little irritation. I opened the cornea at its temporal edge, the thorn being near its nasal edge. With Schlagintweit's hook I was unable to unfix it from the cornea. As I drew it with the hook, the iris tore, and the eye filled with blood.

It is remarkable, how little irritation is sometimes produced, for a considerable length of time, by a foreign body in the anterior chamber. Rognetta[2] saw a fragment of stoneware, of the size of a pea, remain eight days behind the cornea, without producing any severe effects. The external wound had cicatrized. Left beyond a certain time, such a substance would infallibly destroy the eye. It is an interesting fact, however, of which Ammon[3], Salomon[4], and Grüllich[5] have recorded examples, and an instance of which I have myself seen, that a foreign body lying in the anterior chamber, sometimes excites an exudation of lymph from the parts with which it is in contact; that this exudation, becoming organized, forms a sort of capsule over or around the foreign particle; and that, in consequence of this taking place, the irritation caused by the presence of the foreign body ceases. This is an event, however, which we must by no means regard as affording ground for delay in removing foreign bodies from the aqueous chambers.

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[1] Lawrence's Lectures in the Lancet; Vol. ix. p. 531; London, 1826.

[2] Cours public d'Ophthalmologie; Lancette Française, 10 Janvier, 1837.

[3] Gräfe und Walther, Journal der Chirurgie und Augenheilkunde; Vol. xiii. p. 418; Berlin, 1829.

[4] Ibid, Vol. xiv. p. 457; Berlin, 1830.

[5] Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 336; Dresden, 1831.

SECTION III.—INJURIES OF THE IRIS.

Fig. Wardrop, Pl. X. *figs.* 2, 3.

In addition to prolapsus, of which we have already spoken, the more common injuries of the iris are, in the first place, punctures and lacerations through the cornea; secondly, displacement; and, thirdly, separation of the ciliary edge of the iris from the choroid.

I once saw the iris become of a green colour, from exposure of the eye to a blast of steam. Blows on the eyes also cause greenness of the iris, probably from blood being effused into its substance.

The iris is abundantly supplied with red blood. Hence it generally bleeds on being injured, and sometimes so profusely as to fill the aqueous chambers. It is also very liable to adhesive inflammation, effusing fibrine from its injured vessels, and thereby becoming morbidly connected to the neighbouring textures.

1. Punctures and lacerations of the iris are apt to be followed by dilatation of the aperture, so as to form a permanent false pupil. Inflammation is to be guarded against in such cases, and combated by the treatment for iritis; namely, bleeding, mercury, and belladonna.

Case 249.—A gentleman punctured his left cornea near its upper-outer edge with one of the points of a pair of compasses. There was a distinct wound of the iris, stretching from its great circumference to within a little way of the edge of the pupil. The aqueous humour distilled through the wound of the cornea for 14 days. The iris approached gradually to the cornea, and after the wound in the latter was closed, the anterior chamber seemed almost obliterated by the closeness of the two to each other. The wound in the iris continued long open, and the iris was evidently thinned around the wound. The pupil had scarcely any motion, and vision, probably from spherical aberration being imperfectly obviated, was obscure. By and by, the iris retreated to its natural place, no cataract ensued, and vision became perfect. A year or two after, a vesicular swelling formed on the iris at the part wounded, fluid being deposited between the proper substance of the iris and the uvea.

Foreign bodies, such as a minute piece of metal or stone, left in contact with the iris, become incapsulated, as has already been explained.

Penetrating wounds of the cornea are often attended at once by laceration and protrusion of part of the iris. The lacerated and protruding part appears as a flaccid whitish membrane, and ought to be snipt off.

In scrofulous children, punctured wounds of the cornea and iris often end in closure of the pupil and wasting of the eye. A red fungous growth sometimes takes place from an injured iris, and protrudes through the wound of the cornea.

2. Blows on the eye (for instance, with the fist) are not unfrequently followed by displacement of a considerable portion of the iris. The pupil is greatly enlarged; and one-half, perhaps, of the iris is thrust out of sight, so that the pupil extends on one side to the very edge of the cornea. This accident is generally attended by effusion of blood into the eye, and is followed by amaurosis.

3. The connection between the iris and the choroid is much less firm in man than in quadrupeds; and the consequence is, that smart blows on the human eye are apt to separate a portion of one of these membranes from the other, so as to form a false pupil. (*Fig.* 43.) The stroke of a whip, horse's tail, or twig of a tree, is frequently the cause of this accident. We have no means, in such cases, of bringing

back the iris to its former situation. Belladonna dilates the false pupil as well as the natural one, narrowing the portion of the iris between them. The vision of the eye is, in general, much debilitated after this sort of accident.

In a young gentleman who came under my care, the iris was partially separated by a blow with a squib, the natural pupil was at the same time much dilated, and vision obscured. After venesection and the use of calomel and opium, the false pupil began to diminish in size, and the natural pupil also contracted. Vision became almost perfect, but the false pupil did not close; nor have I ever seen the edge of the iris return in such cases to its natural place.

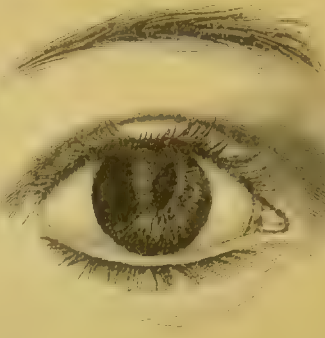
Fig. 43.

A lady, shaking a piece of cloth, was struck on the right eye with a button which lay in it. The result was detachment of the iris at two separate places, and cataract.

When the iris is unhealthy in its structure, as it often is when we operate on it for the formation of an artificial pupil by separation, it is very apt to return towards the choroid; not so in such accidental separations as we are now considering, where the iris is perfectly healthy, and its radiating fibres retain their full power of contraction.

Sometimes the greater part of the iris is detached, in which case it shrinks to a very narrow circle. (*Fig.* 44.) In a case which I saw, all that remained of the iris was a narrow floating shred; the lens was opaque, and lay deep in the vitreous humour; yet with the eye in this state, the patient discerned the fingers. In such cases, the eye, though generally quite amaurotic, is highly intolerant of light, and must be covered with a shade.

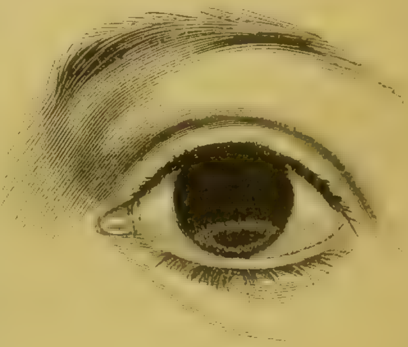
Fig. 44.

In other cases, a blow on the eye at once tears the iris across from its ciliary to its pupillary edge, and separates part of it from the choroid. *Fig.* 45. shows this sort of injury in a patient of the Glasgow Eye Infirmary. Such cases are always attended with effusion of blood into the eye, so that, till this is absorbed, the state of the iris cannot be seen; afterwards we find, generally, the lens dislocated, the vitreous humour dissolved, the iris tremulous, and the retina insensible.

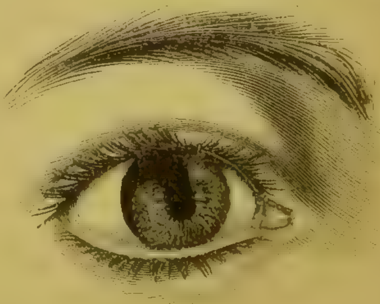
Fig. 45.

When with a penetrating wound of the cornea, there is combined a detachment of the iris, we often observe that the lens and its capsule become opaque, the vitreous humour dissolves, and, as in the instance represented in *fig.* 46, the eyeball enlarges, and the choroid shines through the attenuated sclerotica. The case here represented originated in a penetrating wound with a fork, and the choroid staphyloma grew so large, that, after fruitlessly evacuating, from time to time, the dissolved vitreous humour by which it was distended, I was obliged to remove a portion of the sclerotica and choroid with the scissors, after which the eye shrunk to a size permitting it to be easily covered by the lids.

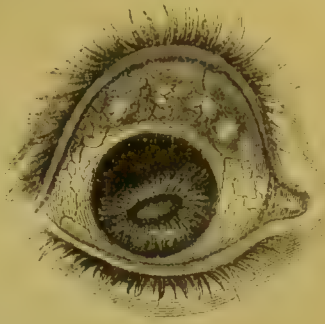

Fig. 46.

SECTION IV.—INJURIES OF THE CRYSTALLINE LENS AND CAPSULE.

§ 1. *Traumatic Cataract.*

Fig. Wardrop, Pl. IX. *fig.* 1.

1. It is a very rare accident, but of which I have witnessed an instance, that a sharp body pushed through the cornea, scratches, but does not penetrate, the crystalline capsule. The consequence is a permanent whitish mark.

2. Penetrating wounds of the crystalline capsule, by pointed or cutting instruments passing through the cornea or sclerotica, are speedily followed by opacity of the lens. This consequence, commonly attributed to the entrance of the aqueous humour within the capsule, seems unavoidable, how small soever the puncture may be. A woman came under my care, to whom it had happened that as she was shaking a piece of cloth smartly, a pin was projected from the cloth into her right eye. It entered about the middle of the cornea, and punctured the capsule immediately behind the edge of the pupil. The result was complete lenticular cataract, and partial opacity of the capsule. If the wound is more considerable, we often see part of the lens exuding from the capsule, and presenting a bluish white appearance, so that it looks like an effusion of lymph. The edges of the puncture or wound of the capsule are apt to inflame, and become of a chalky white colour. If they unite, so that the aqueous humour is no longer admitted into contact with the lens, the progress of the cataract will be arrested. If the wound of the capsule is considerable and does not heal, the whole lens soon becomes opaque, and in young or middle-aged persons is gradually absorbed, so that the pupil again becomes clear, and a certain degree of vision is often recovered.

The injury which produces traumatic cataract is apt to be followed by iritis, and adhesions between the iris and the capsule. The pupil should therefore be as soon as possible brought under the influence of belladonna or sulphate of atropia, and kept so till all danger of inflammation is past, or even till the lens has disappeared. Cold cloths should be applied constantly over the injured eye. The iritis is to be combated by depletion and mercury.

Still more serious effects are apt to arise in cases of penetrating wounds of the cornea and lens; such as retinitis and choroiditis. These may occur with or without injury of the iris. In scrofulous children, such an accident not unfrequently gives rise to amaurosis and atrophy of the eye. Tremulousness of the iris, absorption of the vitreous humour, with coarctation of the retina and ossification of the capsule, and sometimes of the lens, are amongst the sequelæ of such wounds as we are now considering. In an eye which has wasted in consequence of such a wound, the lens or the capsule, having become the seat of calcareous deposition, may be the cause of great irritation, requiring the opaque crystalline to be extracted. Sometimes, after the lens is absorbed, a funnel-shaped opaque membrane is seen behind the seat of the lens. This is the retina, pressed into a conical form by an effusion between it and the choroid, while the vitreous humour has undergone absorption. Such an eye is boggy, and, on pressing it with the finger, the retina can be raised more into view. When the choroid inflames, after wounds of the lens, the sclerotica becomes thinned, and the eyeball assumes an elongated conical form.

Mr. Barton, of Manchester, from the fact that punctured wounds of the capsule are often followed by opacity and thickening of that membrane, with contracted adherent pupil, proposes to treat such cases, from the first, by extraction of the lens. He introduces Beer's knife through the cornea as far as the centre of the pupil, then raises the handle so as to depress the point, and keeps it there for a few moments, till he ascertains whether the lens will escape by merely making a slight pressure with the knife kept in this position. This in many instances takes place; but if he finds it too hard to pass in this way, he extends the incision, and finishes the operation with the scoop.[1] If the case appears likely to demand this mode of treatment, it should at once be had recourse to, as chronic inflammation is apt to induce atrophy of the eye and insensibility of the retina. These results are prevented by extraction.

The wounded lens is often broken, and soon becomes soft and disorganized. It is swollen considerably when in this state, and presses painfully against the uvea. For extraction in such circumstances, Mr. Walker of Manchester used a grooved double-edge knife, which being introduced at the edge of the cornea, and pushed through the centre of the lens, and through the posterior capsule, allows the soft lenticular substance to be discharged along the groove.

3. Blows on the eye are often followed, months or years after the accident, by lenticular or capsulo-lenticular cataract. The capsule, and sometimes the lens, is apt, under such circumstances, to be ossified. Even the least complicated of such cases are not favourable for operation, as the retina is scarcely ever sound.

§ 2. *Dislocation of the Lens.*

Fig. Sichel, Pl. XIX. *figs.* 1, 3, 4.

We may distinguish the following varieties of this injury: —

1. Days, weeks, or months after a slight blow or mere tap on the eye, the lens, loosened from its natural connections, becomes tremulous,

floats in the vitreous humour, or drops through the pupil into the anterior chamber. In consequence of a blow on the right eye, a woman who consulted me, saw dimly, and could read a large type only when she held the book near the eye. The pupil was natural; the lens transparent, but tremulous. Occasionally it happens that the patient cannot recall to his recollection the receiving of any blow on the eye, so that cases of this kind are sometimes regarded as spontaneous dislocations of the lens.[2] There is reason to believe, that occasionally they actually are so; that from disease of the vitreous humour the suspensory ligament of the crystalline comes to be separated in part from the choroid, so that the lens may be seen for a time waving backwards and forwards in the eye; and that ultimately an entire separation taking place, it may either drop down into the dissolved vitreous humour, or come through the pupil. The lens which is thus dislocated, may either be opaque or transparent. In general it is enclosed in the capsule, and when it is so, and at the same time transparent, its edge reflects the light in such a manner as to produce the appearance of its being surrounded by a narrow gilt ring. In general, no pain nor inflammation of the eye attends such cases, but the pupil is commonly dilated, and the retina not perfectly sensible. It sometimes happens, however, that severe pain attends such dislocations, especially if the loose lens get fixed within the verge of the pupil, or impacted between the iris and the cornea.[3] I have seen choroid staphyloma of the lower half of the eye ensue from a dislocated lens being allowed to remain in the latter situation.

Case 250. — Dr. James Brown brought to me, for consultation, a lad of 17, a potter, under the following circumstances. His right eye had been destroyed in childhood. For a considerable time he had been troubled with *muscæ volitantes* before his left eye. On the 1st September, 1831, he received a very slight blow on the eye, with a bit of potter's clay, thrown at him in sport by one of his fellow-workmen. On the morning of the 4th, he found, on rising out of bed, that he saw indistinctly, and went out to wash his eye at a well, supposing that the dimness of sight arose from matter adhering to the eyelids. This produced no difference in the sight; on which one of his neighbours looked at the eye, and told him that he saw something wagging in the inside of it. He immediately came to Dr. Brown, who discovered the lens lying at the bottom of the anterior chamber. It seemed quite transparent even on the 5th when I saw him, and was so much reduced in size as to move freely about on every inclination of the head. Its lower edge, where it rested on the floor of the anterior chamber, was somewhat square, as if absorption had been going on more rapidly there than elsewhere. The upper edge of the pupil was not covered with the lens, so that he saw over it. Belladonna was applied on the afternoon of the 5th, the pupil dilated, and that evening the lens fell back through the pupil into the posterior chamber. Next day he had no pain, and saw well, but the iris was evidently tremulous.

I had no doubt that in this case the dislocated lens would entirely dissolve; but the rest of the eye, unfortunately, appeared not to be in a sound state, and the patient was likely to become amaurotic.

2. From a penetrating wound or from a blow, the capsule bursts, and the lens comes into contact with the uvea. This dislocation is generally attended by considerable pain and inflammation, sometimes running on into suppuration within the eye, and often followed by amaurosis. If the lens is soft it may dissolve, especially in young people, and the pupil clear. If hard, it is merely somewhat reduced in size, and is apt to come forward from time to time into the anterior chamber, and again slip back through the pupil.

Case 251. — A stout countryman, whilst working in a quarry, received a blow with a piece of stone on his right eye, four weeks before I saw him. He put himself under the care of the ignorant pretender to whom I have referred at page 387, who allowed him to remain without anything being done which could effectually relieve him of the incessant and excruciating pain which he suffered in the eye and head. The sclerotica was intensely inflamed, the cornea unnaturally prominent and somewhat hazy, the iris in contact with the cornea, and the lens, broken in pieces and apparently swollen, lay in contact with the iris and cornea. Immediately below the cornea, the sclerotica presented a concave depression, where it had been struck.

It was evident that the capsule had burst; and that the lens, being pressed forward, had obliterated the aqueous chambers; an accident always productive of severe pain. I immediately opened the cornea by a small section at its upper edge, and instantly the soft disorganised lens was evacuated. The patient had four grains of calomel and two of opium at bedtime. The pain entirely ceased in the course of the afternoon, and never returned. On the 7th day after the extraction, he left Glasgow, to return to the country. There was still considerable zonular redness; shreds of opaque capsule occupied the dilated pupil; the lower part of the sclerotica still presented a concavity, instead of its natural convexity; vision, which from the violence of the injury and long neglect of proper means of relief, there was reason to fear had been altogether lost, appeared in some slight degree to be returning, the patient perceiving light and shadow when he looked to his right.

A remarkable circumstance in the case just now narrated, was the permanent flattening given to the sclerotica by the momentary pressure of the stroke. We are not surprised that the eye should be bent for a moment from its natural shape; but that this effect should continue, is a thing not easily explained. We, however, see it happen to the eye not unfrequently; and in the following case the cornea presented itself in this deformed state: —

Case 252. — An angular fragment of iron, about half an inch long, chipped off by a chisel, penetrated the right cornea of Samuel Lamont, within a line of its upper margin. Though immediately removed, it produced cataract and dislocation of the lens, as in the last case, with very violent inflammation, which continued unabated for five weeks before the patient came to the Glasgow Eye Infirmary, notwithstanding blood-letting, leeching, and blistering. The lens was extracted by Dr. Rainy, with the same striking relief which extraction generally affords in such cases. The cornea, at his admission, was more convex in its horizontal than in its vertical section, as if it had been compressed laterally. This form, which it permanently retained, served materially to impair the patient's vision. The retina appeared to be sound, and he saw with considerably more distinctness when he viewed objects through a four-inch convex glass.

3. The capsule bursts from a blow, and the lens having passed through the pupil, lies impacted between the iris and the cornea. The lens may continue transparent for many days after dislocation into the anterior chamber. If hard, it may remain for years in that situation. I have known the burst capsule accompany the lens into the anterior chamber, in which case they sometimes become the seat of calcareous deposition.

Case 253. — James Lang, aged 66, applied at the Glasgow Eye Infirmary, on the 22nd August, 1831. Nine weeks previously, he received a blow with a piece of wood, on the right eye. The blow had ruptured the capsule, and the lens was lying in front of the iris. The pupil was much dilated. He had been greatly distressed since the accident, with circumorbital pain during the night, so that he had had little or no sleep. There was not much redness of the eye. Pulse 84. The left eye was glaucomatous, and he thought the vision of this eye had failed since the accident which had happened to the right.

The upper half of the cornea being opened in the way usually practised for extraction, the lens immediately escaped, followed by some dissolved vitreous humour. The lids of both eyes were brought together by strips of court plaister, and he was desired to keep his eyes quiet, as if he were asleep.

Next morning, he told us he had slept more during the preceding night, than he had done during the whole nine weeks he had suffered from the accident. He now complained little or none of the pain. There had been considerable watery discharge from the eye. The pupil remained widely dilated. It was uncertain whether he discerned light with the eye.

On the 24th, the edges of the incision were accurately in apposition. The pupil was still dilated, and the retina apparently insensible to light.

On the 9th September, he was dismissed, the eye perfectly free from uneasiness, but without any return of vision.

This, then, was a case of rupture of the crystalline capsule from a blow on the eye, a large hard lens passing through the pupil, and lodging in contact with the cornea for nine weeks, without becoming cataractous, or undergoing any sensible diminution in size, but causing incessant uneasiness, and during the night severe circum-orbital pain. The practice adopted was simply extraction of the lens, which, under such circumstances, must be regarded exactly as a foreign body. The patient did not require a single opiate, and had scarcely a twinge of pain after the lens was removed.

4. A blow separates the capsule, enclosing the lens, completely from its natural connexions; the lens, suffering disorganisation, assumes a fluid form; the capsule becomes thickened and opaque; and this *cataracta cystica* swims behind the pupil in a superabundant aqueous humour.

5. The lens, forced out of the capsule, is seen floating deep in the dissolved vitreous humour. This variety of dislocation of the lens generally arises from a blow on the eye, which fills the aqueous chambers with blood. The blood is slowly absorbed; and then the lens is seen deep behind the pupil. If we puncture the cornea, the aqueous humour escapes, and the lens floats forward to the iris or to the cornea.

Case 254. — We have an illustration of this variety of dislocation of the lens, in the right eye of Mary Mains, aged 50, admitted at the Glasgow Eye Infirmary on the 7th September, 1831.

A month before her admission, she received a blow with the fist on the right orbital region. The integuments had been divided above the eyebrow, but the wound, at her admission, had perfectly healed, although the cicatrice was still tender to the touch. The right pupil was dilated, the iris tremulous, the humours glaucomatous, the sclerotica and conjunctiva slightly injected with blood, and she had violent hemicrania. She could, with the affected eye, still distinguish the fingers and other large objects. Pulse 78; much thirst; bowels bound.

On the admission, then, of the patient, there was no appearance of dislocation of the lens. There was amaurosis, and, from the tremulousness of the iris, there was strong reason to suspect a fluid state of the vitreous humour. I took the opportunity to remark to the students, that this was one of those cases which are apt to be mistaken for examples of sympathetic amaurosis, arising from an injury of some of the branches of the fifth pair. She had received a cut above the eyebrow, and, had she not been conscious that her eye was struck as well as her brow, we might have been led to suppose, perhaps, that the cut on the brow was the cause of the failure of sight.

This patient was bled at the arm to the extent of 25 ounces; had 6 grains of calomel and 2 of opium at bedtime; and, next morning, a dose of sulphate of magnesia. On the 9th, the hemicrania was much relieved. She was ordered a pill of 2 grains of calomel and 1 of opium every night. On the 10th, she told us that the pain had returned on the afternoon of the 9th, and that it still continued severe. The conjunctiva and sclerotica were more inflamed. She was cupped on the right temple, and ordered to take two of the pills at bedtime. The pain was relieved by the cupping. On the 12th, the salts were repeated. On the 13th, the pain continued mitigated, and the redness was less. On the 14th, she told us that the pain had set in again in the afternoon of the 13th, and had continued severe until about eight in the evening, when it ceased, and that she found her vision had become much better than it was the day before. At the visit we found the eye free from pain, and she saw so much better, that she could distinguish one individual from another. The tremulousness of the iris was not so observable, but the pupil was more dilated. The lens had, from the previous day, become moveable, and was seen, of a glaucomatous appearance, bobbing about on every motion of the head, at a considerably greater distance than natural behind the pupil. The upper part of the dilated pupil was clearer than the rest, the lens being partially sunk.

Such dislocation of the lens as occurred in this case, we may call *secondary*. It did not result immediately from the injury, but from the vitreous humour undergoing a still farther degree of dissolution than it had suffered at the patient's admission, a month after the injury.

6. The choroid, sclerotica, and capsule being rent by a blow, the lens escapes out of the eye, and lies under the conjunctiva.

Case 255.—The annexed figure represents the effects of two different accidents, which, at the interval of some years, befell the right eye of an old man, the first patient in whom I happened to meet with a sub-conjunctival dislocation of the lens. On inquiring into the history of his case, he told me that the separation of the iris, represented in the figure, had been the result of the earlier accident, but that the tumour which I saw at the upper part of his eye was the consequence of a recent fall on the corner of a chair. The tumour had exactly the form of the lens, and the natural pupil was dragged towards it. On slitting up the conjunctiva, the crystalline was easily withdrawn. The opening through the choroid and sclerotica, by which it had escaped, seemed already perfectly united. The retina was nowise impaired, notwithstanding the serious effects produced on the other textures of the eye, by the two accidents, and with a cataract-glass the patient could read an ordinary type.

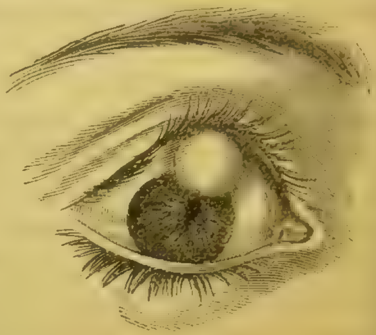

Fig. 47.

Mr. Dixon records a case in which both lens and iris had disappeared from the eye, in consequence of a blow. The sclerotica bore marks of having been ruptured, and Mr. D. regarded the case as a sub-conjunctival dislocation both of the iris and the lens. The retina retained its sensibility, so that through a hole in a card and a convex lens, the patient could read.[4]

7. The cornea is sometimes accidentally divided by a sharp instrument, and the capsule being opened at the same time, the lens escapes from the eye.

Case 256.—This accident happened to a little boy, who was cutting a stick with a penknife. He immediately ran to his father's gardener, who observed some clear substance issuing from the wound. After the inflammatory symptoms were subdued and the wound had healed, it was found that vision was very imperfect. I was consulted whether it were likely to be restored. On passing a lighted candle before the eye, no inverted image was to be seen. I concluded, therefore, that the lens was gone. On trying how the little boy could see through a thick convex lens, I found he saw no better than without it. This showed that the eye was incompletely amaurotic.

In such circumstances as were present in Case 250, of course no operation is necessary. We leave the lens, already reduced in size, to be dissolved. But if it is enclosed in the capsule, the lens will not dissolve; and ought, therefore, to be extracted.

In performing extraction under such circumstances, it is advisable to pass a curved needle through the sclerotica and fix it in the lens; then open the cornea in the usual way; and with the needle push the lens out of the eye. If this precaution is not taken, on the section of the cornea being made, the dislocated lens is apt to fall immediately back through the pupil, deep into the vitreous humour, whence it will be difficult to fish it up, and extract it, by a hook.

In the 2nd variety, where the dislocated lens presses against the uvea, if the pain and inflammation are not immediately subdued by venesection, belladonna, and calomel with opium, extraction is the most effectual means both of relieving the patient, and, should the retina be sound, of securing useful vision in the injured eye. If the lens is soft, a small section of the cornea will be sufficient for its removal.

In the 3rd variety, where the lens lies in front of the iris, there is, in general, still less ground for hesitation as to the propriety of extraction. When a hard bulky lens lies in contact with the cornea, let the cornea be opened, as in common extraction of the cataract, care being taken, however, to pass the knife behind the dislocated lens, in order to prevent, if possible, the lens from slipping back through the pupil, and sinking into the vitreous humour, which, in cases of this sort, we generally find in a fluid state. To secure ourselves against this, the needle may first of all be introduced, as above directed.

In cases of the 4th and 5th varieties, the dislocated lens or cataracta cystica is perhaps left for years, bobbing about in the posterior chamber on every movement of the eye or head; occasionally passing through the pupil, and returning again into the posterior chamber; till, on some particular occasion, more irritation being excited by its presence in the anterior chamber than usual, iritis comes on with great pain in the eye and head, contraction of the pupil, and an impossibility of getting the dislocated body to retire, as it had been wont to do, into the posterior chamber. Under these circumstances, although unfavourable for an operation, extraction is performed, to free the patient from the severe pain attending the iritis, and to save the sound eye from the danger of sympathetic inflammation. It were better to have recourse to the operation immediately after the occurrence of the accident.

I have recommended extraction as the most advisable operation in most cases of dislocated lens. Peculiar circumstances, however, may lead the surgeon merely to remove it, with the needle, from the anterior or posterior chamber, leaving it in the situation which the cataractous lens is made to assume in the operation of depression or reclination. This is best effected by a bent needle, passed through the sclerotica, and the point of it inserted into the back of the lens. In young people, in whom the lens is soft, division may be practised either through the cornea or the sclerotica; and, as it is difficult to lacerate the capsule or break up the lens in such cases, advantage may be taken of the plan of steadying the dislocated body by a needle passed through the sclerotica, on the one side of the eye, while a second needle, entered on the opposite side, is used to effect the division.[5]

The patient, in whose eye a dislocated lens floats occasionally through the pupil, having found relief from pain when the lens slipped back into the fluid vitreous humour, may be averse to any operation. Irritation being set up, however, when the lens falls forward into the anterior chamber, the pupil is apt to contract, and the plan of lying supine, and allowing it by its own gravity to fall back through the pupil, he finds no longer to succeed. Under these circumstances, dilatation of the pupil by the solution of atropine, while the patient remains lying on his back, will often accomplish the desired object.

I have seen several other cases of dislocation of the lens under the conjunctiva, besides the one related and figured above. In one of them, the injury was the consequence of the patient being gored by a cow, and, in this case, the eye was partially amaurotic. In another, it was totally so. This, as well as the 7th variety of dislocated lens, requires no further illustration.

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[1] London Medical Gazette; Vol. v. p. 784; London, 1830.

[2] Lusardi sur la Cataracte Congéniale, p. 29; Paris, 1827. Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 260; Dresden, 1831. In the fifth volume of Ammon's Zeitschrift, Dr. Lorch relates a case, in which dislocation of the lens occurred in both eyes, after a fall on the back of the head.

[3] See cases of spontaneous dislocation of the lens, by Neumann, Edinburgh Medical and Surgical Journal; Vol. lxxv. p. 120; Edinburgh, 1851: Bowman, Lectures on the Parts concerned in the Operations on the Eye, pp. 132, 133, 135; London, 1849: Balfour, Medical Times, March 15, 1851, p. 291: Dixon, Lancet, February 14, 1852, p. 171.

[4] Lancet, November 27, 1852, p. 486.

[5] Dixon, Lancet, October 1, 1853, p. 313.

SECTION V.—WOUNDS OF THE SCLEROTICA AND CHOROIDEA.

If the sclerotica is penetrated by a thorn, it should, if entire, be carefully drawn out. If it has broken short, it is more difficult to remove. Mr. White Cooper, in a case of this kind, adopted the following plan with success. Having, with a sharp cataract needle, made a superficial incision on each side of the thorn, he grasped it with a pair of fine forceps, and smartly twitched it out.[1] The same plan may be available when a thorn sticks in the cornea, and is broken off on a level with its surface.

From the retina being generally implicated, wounds of the sclerotica and choroid are more dangerous to vision than wounds of the cornea. Indeed, rupture or laceration of the sclerotica scarcely ever happens, without loss of vision.

Incised wounds of the conjunctiva and sclerotica are instantly followed by a protrusion of the choroid, which we have no other means of repressing, than by directing the patient to keep the eyelids shut as much as possible, so as to give a degree of support to the eyeball. The protruding choroid will gradually shrink, and we need neither puncture it, nor snip it away. The wound never heals without leaving a considerable cicatrice, the space between the edges of the divided sclerotica being filled up by an effusion of lymph, which gradually assumes the appearance and texture of a membrane. The conjunctiva sometimes heals in cases of this kind, while the sclerotica continues open, with the choroid projecting through it.

I have seen a small puncture of the sclerotica and choroid, near the edge of the cornea, give rise to tremulousness of the iris and incomplete amaurosis, followed some years after by opacity and ossification of the lens. In other cases, I have met with prolapsus of the iris through a punctured wound in the same situation. When the edge of the cornea, and that of the sclerotica are divided, the choroid muscle or annulus albidus being wounded, and the iris dragged to one side, not merely is the injured eye lost, but sympathetic ophthalmitis of the opposite eye is likely to follow.

A very dangerous class of wounds of the eye are those inflicted by arrows shot by children in play, and by the sharp end of the shuttle leaping from the steam-loom. The cornea, in some cases, and the sclerotic and choroid, in others, are laid open, the cavities fill with blood, the retina is rendered insensible, and the eye is ultimately left disfigured and atrophic.

When both sclerotic and choroid are divided in a considerable extent, the vitreous humour immediately issues from the wound, which also bleeds profusely. The vitreous cells become injected with blood, and form a fungus-like protrusion from the wound, which it is proper to snip off with the scissors. In other respects, this case is to be treated as has been already mentioned. Besides the use of antiphlogistic means, the eyelids must be kept shut. Most frequently vision is entirely destroyed by the loss of vitreous humour, the injury done to the retina, and the violent inflammation of the eye which follows the accident. The inflammation, however, is not so violent where much of the vitreous humour is lost, as where only a small quantity escapes, nor is the form of the eye necessarily lost, although is has been emptied of a great part of its contents. An aqueous fluid fills the cavity of the eye. If almost all the vitreous humour has been evacuated, the membranes shrink, and the eye remains in a dwarfish state; it is moveable, and can be covered by a glass eye.

If the lens has been left in the eye, it becomes opaque; but frequently the lens escapes through the wound along with the vitreous humour. An opaque deposition at the bottom of the eye is not an unfrequent result of penetrating wounds of the sclerotica and choroid, as I shall have occasion to state more fully, under the head of *Non-malignant Tumours of the Eyeball,* in a subsequent chapter.

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[1] London Journal of Medicine; Vol. iii. p. 975; London, 1851.

SECTION VI.—FOREIGN BODIES IN THE VITREOUS HUMOUR.

Foreign bodies, such as fragments of glass, wood, iron, or stone, may be driven into the vitreous humour, either through the cornea and pupil, wounding and displacing the lens in their passage; through the cornea and iris, lacerating the latter, and generally wounding the lens; or through the sclerotica and choroid, in which case the retina is apt to be torn and destroyed. They are often sent with such violence into the eye that they sink entirely out of view; the patient is not conscious that any thing has lodged in the eye; he merely supposes it to have been cut or injured externally; and a hurried or superficial examination by the surgeon may not reveal the full extent of the mischief which has been inflicted. The blood effused into the eye, in such cases, is gradually absorbed, the inflammation is combated by the usual remedies, the wound contracts and heals, with dragging perhaps or closure of the pupil, opacity of the lens, and insensibility of the retina. But the eye still continues irritable, the iris assumes a greenish or reddish hue, the sclerotica becomes thinned, and the eye soft and atrophic. By and by the eye may become the seat of acute pain, which sometimes intermits for weeks or months, and is then renewed with very painful severity. At length, the wound, which had previously been cicatrised, opens, and allows the foreign substance to protrude. It is drawn forth, and often proves of a size so large as to excite the wonder of all concerned how it had lain so long concealed within the eye, or how it had been capable of lodging there at all.[1] Under such circumstances, sympathetic ophthalmitis of the sound eye is apt to be excited during the pressure of the foreign body in the eye, or after it is extracted.

In severe wounds of the eye, in which there is a suspicion of a foreign body having passed into its interior, a careful examination of the injured organ should be instituted, while the patient is under the influence of chloroform. The immediate extraction of the foreign substance will not merely prevent a great amount of immediate suffering from the state of the wounded organ, but may be the means of saving the sight of the sound eye from being lost from sympathetic inflammation.

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[1] See case by O'Beirne of a nail three-quarters of an inch long, retained in the eye three weeks; Dublin Medical Press, July 7. 1841, p. 11; case by De Castelman, of a splinter of steel, about half an inch long, retained in the eye three years and a half; Archives Générales de Médecine, Octobre, 1842, p. 210.

SECTION VII.—PRESSURE AND BLOWS ON THE EYE.

§ 1. *Amaurosis from Pressure.*

Beer relates the following instance of the bad effects of pressure exercised on the eyeball:—

Case 257.—A man, who had previously enjoyed excellent sight, happened to be in a company of friends, when suddenly a stranger stept behind him, and clapped his hands upon his eyes, desiring him to tell who stood behind him. Unable or unwilling to answer this question, he endeavoured to remove the hands of the other person, who only pressed them the firmer on the eyes, till at length withdrawing them so as to allow the eyes to be opened, the man found that he saw nothing, and continued ever afterwards blind, without any apparent lesion of the eyes.[1]

§ 2. *Amaurosis from Blows.*

Blows on the eye are often productive of temporary or permanent amaurosis, with scarcely any visible change in the organ; whence we may conclude that the blow has affected the retina by concussion, congestion, extravasation, or laceration. It is unfortunate that such cases of traumatic amaurosis are often neglected, till the blindness is confirmed; for much may be done for their relief if they be taken in proper time. The following cases illustrate the danger of neglect, and the good effects of appropriate treatment:—

Case 258.—Mr. N. applied to me on the 18th of January, 1829, on account of the effects of a blow which he had received, eight days before, with a pretty heavy piece of metal, on the temporal side of the left eye. He was a man of about 40 years of age, of sound constitution, and his eyes had been good till this accident. Any inflammation or irritation produced by the blow had already subsided, although almost nothing had been done in the way of treatment. The vision of the eye was lost, except when he turned it very much to the left, so much, indeed, as to look almost behind him. When he did so, he saw indistinctly any object situated to his left. Forwards or to the right he saw nothing, every thing being darkened by the appearance of a thick gauze or mist. A bright light, as a gas flame, was the only object capable of producing a sensation, when the eye was directed forwards. The amaurosis was so considerable, and had been neglected for so many days, that I pronounced a very doubtful prognosis, but urged the adoption of active measures.

Thirty ounces of blood were taken from the arm on the evening of the 18th. He took two pills, each containing three grains of blue pill mass and two grains of aloes, and was ordered two thrice a-day. On the 19th, he thought he saw objects somewhat less indistinctly, but still only when he looked much to the left hand. When he looked forwards, he saw as if gauze threads were moving before him, and the lamp appeared of various colours. Twenty-four leeches were applied round the eye. On the 20th, his vision was so far improved, that he could make out the large characters on the back of a quarto book when he looked at it sideways. He could recognise any ordinary object, as a tea-cup, held towards his left side, but lost sight of it entirely as it was moved in front of him. A blister was applied to the left temple and behind the left ear. On the 22nd, there was a great improvement in vision. He could now tell the hour on a watch, even when he looked straightforwards, and compared the apparent impediment of vision to branches of trees, whereas it formerly had the appearance of a uniform cloud. The mouth being considerably affected by the pills, they were omitted. The blister was re-applied. On the 24th, the blister was discharging well, the mouth was very sore, and the vision much improved. He could read a newspaper with the left eye, and said that the branches of trees which appeared before him were now broken, and looked like grains of sand separated one from another. On the 26th, he stated that he knew an increase of vision daily. The mouth was still very sore. The blister was repeated. After this, the vision continued progressively to improve, and by the middle of February was all but perfect.

Case 259.—John Robertson, aged 17, was admitted at the Glasgow Eye Infirmary, on the 13th June, 1831, six weeks after receiving a blow with a stick on the left eye. The lids swelled very much at the time, so that he could not open the eye for some days. When able to open it, he found the vision almost entirely lost, all that he retained of it being a mere perception of light and shade. We observed that the pupil moved sympathetically with the other, but upon being exposed by itself, it contracted very feebly, on exposure even to bright light. Pulse 78; tongue foul.

He was bled at the arm, and ordered two mercury and aloes pills thrice a-day. Next day, he could discern objects. The pills not having purged him, he was ordered a dose of calomel and jalap. In a few days, the eye was perfectly well.

If it were necessary, I could quote several similar cases, showing the good effects of depletion, counter-irritation, and mercurialization, in amaurosis consequent to those blows on the eye, which are probably productive of congestion of the choroid and retina, but unattended by any other considerable lesion of these important structures.

§ 3. *Effusion of Blood into the Eye from Blows.*

The internal textures of the eye frequently give way under a blow; the blood-vessels of the choroid or of the iris burst, and fill the cavities of the eye more or less with blood. Sometimes the bottom only of the anterior chamber seems to contain effused blood; but if we dilate the pupil by belladonna, and examine the eye catoptrically, we generally find that neither the deep erect nor the inverted image is visible, showing that the surface of the lens is covered with blood. Vision is hazy under such circumstances. Sometimes the aqueous humour is quite changed in colour from effused blood, and the cells of the vitreous humour are also filled with that fluid. The cornea, in such cases, presents a deep uniform chocolate hue, through which neither pupil nor iris can be seen. The vitreous body is generally disorganised under such circumstances, and the retina rendered insensible; although in some rare instances it happens, that as the effused blood is absorbed, vision is restored.

If we puncture the cornea in cases of this kind, there is, in general, a profuse discharge of bloody watery fluid. If the puncture is small, it heals in 24 hours, and may be repeated from time to time, without any ill effects. The vitreous humour may also be evacuated through a puncture of the sclerotica.

The same treatment should be followed, as in amaurosis from blows.

§ 4. *Bursting of the Eye from Blows.*

In consequence of blows on the eye, with the fist, sticks, stones, and various projectiles, and from falls on the eye, we frequently meet with laceration of the sclerotica and choroid, with or without rupture of the conjunctiva. Sometimes, though not so frequently, we meet with laceration of the cornea, which is more resisting than the sclerotica. The place of the eyeball most apt to burst under a blow is immediately anterior to the insertion of the recti. The conjunctiva, from its laxity, sometimes escapes, while the sclerotica, owing to the tension produced by its contents, is unable to withstand the effects of a blow, and consequently gives way. From a blow with the fist, I have found the sclerotic and conjunctiva rent behind the cornea, the humours evacuated, the eye flat, and the cornea sunk back into a concavity. Next day, the eye has been plump, and the cornea pretty natural, the cavities filled with blood, and the retina insensible. As I have already mentioned, I have repeatedly seen the sclerotic and choroid ruptured, with the lens propelled through the lacerated opening, so as to lie immediately under the conjunctiva, which remained entire.

Case 260.—A gentleman accidentally struck his right eye with his thumb, and ruptured the cornea at its upper edge, giving occasion to a large prolapsus of the iris. On examining his left eye, I found it presenting a distinct arcus senilis a little way within the verge of the cornea, while between the arcus and the sclerotica the cornea seemed thin and transparent. This transparent space was the seat of the rupture of the cornea, which had, I presume, been weak, and therefore unable to withstand the sudden force applied to the eye. The wound contracted slowly, and healed, with the pupil dragged upwards. The capsule of the lens soon after became opaque.

In cases of bursting of the eye from a blow, whether the laceration is through the cornea or through the sclerotica, considerable hæmorrhagy generally takes place, especially when the choroid has also given way. The humours are also often partly, and sometimes almost wholly evacuated, so that a dwarfish deformed eyeball is left after the lacerated part heals up. If the lens, or shreds of the iris, project through the wound, they should be removed, as they will prevent the wound from healing.

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[1] Pflege gesunder und geschwächter Augen, p. 10; Frankfurt, 1802.

SECTION VIII. — GUNSHOT WOUNDS OF THE EYE.

1. Under this head, I may notice some of the effects of gunpowder exploded into the eye. It is generally the lower portion of the cornea which suffers most from this accident; but in an instance which came under my observation, as the person was in the act of stooping to the ground when the powder exploded, only the upper half of each cornea received the injury, and was left opaque. I have repeatedly seen grains of powder propelled through the cornea into the lens, so as to cause cataract. In one case, a grain of powder, propelled through the cornea, traversed also the lower part of the iris, in which it left a considerable opening, and, striking the lens, produced cataract. Gradually the opaque substance cleared away behind the false pupil, and vision was restored. The natural pupil remained much longer cataractous, but at length it cleared also. The patient saw well with a cataract-glass.

2. Injuries of the eye from grains of small-shot are not unfrequent. Mr. Lawrence mentions[1] that he once saw complete blindness caused by a single grain, which merely struck the sclerotica obliquely, and did not enter. A spent shot bruises the eye, but may not penetrate; it causes ecchymosis, and by concussion of the retina, may produce blindness. It may lodge beneath the conjunctiva.

Striking the eye obliquely, a grain of shot may glance off, and leave the appearance of a furrow in the conjunctiva. The cornea, injured in this way, appears to lose its vitality, becomes opaque, and falls into a state of ulceration.

If the grain strikes point-blank, and passes through the sclerotica, it is almost always fatal to vision; and the same result follows, if the grain perforates the cornea and passes deep into the eye. But if it lodges in the anterior chamber, the retina may retain its sensibility, the grain sinking in the aqueous humour. An incision is to be made, under such circumstances, with the extraction knife, and the grain removed. If this is not done, it may become incapsulated. If the grain passes very obliquely through the sclerotica, it may wound the lens, and remain in the vicinity of the iris. In this case, the retina retains for a while its sensibility; by and by, the eye becomes atrophic.

It not unfrequently happens that grains of shot traverse one or other eyelid, and then penetrate into the eyeball; and that they lodge also in the cellular membrane of the orbit. Symptoms of inflammation within the cranium are not uncommon after such injuries, and the patient is often affected with severe neuralgia.

The question whether a grain has penetrated into the eyeball is generally settled by our finding a shot-hole in the cornea or the sclerotica, when the accident has actually been of this serious kind. Through the shot-hole there is generally a small protrusion of the iris or the choroid.

In one case which I saw, a grain passed through the sclerotica, close to the cornea. Vision was instantly extinguished. Severe inflammation followed; the iris became of a dark greenish hue; the pupil was deformed, the iris being broader towards the wound than in the rest of its extent; and the eye was boggy. In another case, a grain passed through the lower lid into the eyeball. The wound in the sclerotica presented the appearance of a slit, through which oozed the vitreous humour. The pupil was rather contracted, and muddy from effused lymph. Vision with the wounded eye was dim, yet the patient saw every thing with it. The conjunctiva became chemosed. Gradually the pupil cleared, but opacity of the lens ensued. The interior of the eye suppurated, and matter was discharged by the wound in the sclerotica. Demours has figured a case in which a grain of small-shot passed through the cornea, detached the iris from the choroid, and produced opacity of the lens.[2] He relates another case, in which a double grain passed into the sclerotica, near the edge of the cornea, and remained fixed, the one grain being without and the other within, till he extracted them. The sight of the eye was saved.[3]

Any attempt to remove a lead pellet from the eye, when it has passed either through the cornea or the sclerotica into the vitreous body, I should suppose would be fruitless, and likely only to irritate the eye and lead to inflammation. Left in the vitreous humour, the pellet will probably sink down into contact with the retina. Vision, as far as I have seen, is totally destroyed by such an accident; and I have never known of the foreign body coming to the surface, so that it might be extracted, although Stöber relates a case in which this seems to have happened, and in which vision was restored.[4] I have never known sympathetic ophthalmitis excited by the presence of a pellet in the eye. Should such a consequence arise, the eye should be treated as Mr. Barton has recommended in cases of fragments of percussion caps lodged in the eye. Severe neuralgia is a consequence of such wounds as we are now considering. A gentleman, by whom I was consulted, submitted to have the eye extirpated on account of the pain he continued to suffer. This was done by an eminent surgeon in Edinburgh. Immediately after the operation, the eyeball was cut to pieces, but no pellet was found. The neuralgia, however, subsided.

Case 261. — A young man was looking up towards a tree, upon which was seated a woodcock his master was about to fire at; upon the young man's giving the signal, the sportsman fired, and several grains of the small-shot, rebounding from the boughs, struck the lad, perforating the eyelids and skin of the forehead. One entered the left eyeball, immediately above the upper edge of the cornea. The surgeon tried to trace the grains of small shot with the probe, into the cellular membrane of the orbit, but could not touch any of them. The lad was leeched and purged.

I saw him nine days after the accident, when the eye presented the appearance represented in the annexed figure. There was a red vesicle-like protrusion of the choroid at the place where the grain had entered the eye, and round this the sclerotica was considerably depressed. The iris was deficient at its upper part, where it had been torn through by the grain of shot. Behind the pupil there appeared a reddish white cloud, the remains of the blood effused into the vitreous humour. The patient retained a bare perception of light and shadow with this eye.

The right pupil was large and sluggish. With this eye the patient could read the large letters of a title-page. It appeared probable that some grains of small-shot were lodged in the cellular membrane of the right orbit.

In the course of some months the vision of the right eye improved, while the left eye became more and more atrophic, the lower part of the cornea sinking into a concave form, and the humours behind the pupil assuming a yellowish green colour.

Case 262. — Mr. H., aged 50, came from Camborne, in Cornwall, and first consulted Dr. Butter, at Plymouth, in September, 1830, on account of total blindness in his left eye, accompanied occasionally with great pain. He had also some degree of amaurosis, with photopsia, of his right eye. The following was the history of his case: —

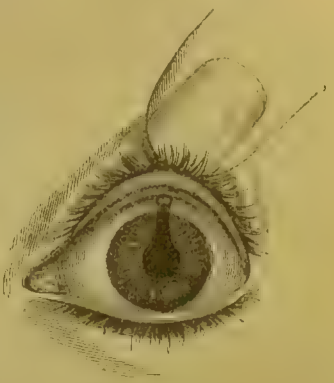

Fig. 48.

On the 19th February, 1827, whilst shooting, a gun was fired at a woodcock by another person, and a shot lodged in his left eyeball, producing instant blindness. For a fortnight afterwards, he did not suffer greatly; but during the four years and a half preceding his application to Dr. Butter, the pain would at times flash so suddenly and intensely through his left eye and head, and so seriously disturb the visual functions of his sound or right eye, that in whatever occupation he was engaged, his sufferings obliged him to desist for a time, and to apply leeches and other remedies. The fear of losing the sight of his sound eye from sympathy, added to the pain of his left, induced him to seek, and even to urge, the extraction, if possible, of the shot, which he knew, from his acute feelings, must be situated in some very sensitive part of his left eye.

The left eye was rather less in size than the right. It was entirely free from inflammation. On the nasal side of the eye, a fistulous opening was perceived a little behind the edge of the cornea. A fine gold probe could be passed through this opening, nearly into the posterior chamber. It was evidently the entrance of the shot. The iris was not materially altered. Behind it a cataract was distinctly seen.

Dr. Butter, in consultation with Mr. Luscombe, agreed to dissuade Mr. H. against an operation, or any attempt to search for a shot the position of which was extremely doubtful and uncertain; but it was the wish of the patient that some trial should be made.

On the 9th September, 1831, Dr. B. extracted the cataract, which consisted of calcareous matter and spiculæ of bone. He afterwards syringed out some gritty matter. It was hoped that the removal of this bony lens would be followed with corresponding relief, but in this hope the parties were disappointed.

On the 23d February, 1833, Mr. H. returned to Plymouth, and requested Dr. B. to make a farther attempt for the removal of the shot, which his feelings denoted still to remain within his eye. He pointed to a bluish and prominent part of the eyeball under which he thought the shot was lodged. Dr. B. hooked up the prominent portion of the sclerotica, cut it off with the scissors, and made an aperture sufficiently large to enable him to explore with the probe the cavity of the eye, and to allow the exit of the vitreous humour. Still no shot was found. Mr. H. determined to have his whole eye extirpated at a future period, should his complaints not be alleviated by the suppuration following this second attempt.

On the 23d September, 1833, Dr. B. removed the whole of the left eyeball, with the lacrymal gland, and divided the optic nerve close to the foramen opticum, fearing lest he might still miss the object of pursuit. On dissection of the extirpated parts, he had the satisfaction to find a duck shot impacted so firmly in that part of the optic nerve which joins the retina, that a considerable effort was required to detach it from its bed, in which it must have been fixed for six years and six months.

At the end of a fortnight, the patient was nearly well, but for three weeks afterwards was detained on account of adhesions which formed between the lids and subjacent parts, and which Dr. B. repeatedly divided. Some morbid sensations were felt in the ophthalmic division of the fifth pair, and also in the ramifications of the superior maxillary, for which Dr. B. prescribed carbonate of iron. Mr. H. returned home, forty-seven days after the operation; the strength of his right eye increasing daily, and the neuralgic complaints becoming mitigated.[5]

3. Mr. Watson notices[6] two cases in which small portions of exploded percussion caps having struck the eyeball, complete blindness was the immediate consequence, although the eye retained its natural appearance and no serious wound seemed to have been produced.

I have seen several instances of one of the fragments, into which a percussion cap breaks when it is exploded, entering the eye. This may happen either in shooting with percussion caps, or in discharging them with a hammer, as children sometimes do for amusement. In such cases the injured eye is exceedingly liable to be lost, while sympathetic inflammation may endanger the other eye, especially if the foreign body is left unextracted.

Sometimes a fragment of an exploded cap fixes in the cornea, but is not detected, being immediately hid in the whitish scarred substance of the cornea. After some days, a blackish point is seen protruding from the slough. This is the bit of cap, which, being extracted, is found to be rough and angular.

The fragment, traversing the cornea, may lodge in the anterior chamber, or fix itself in the iris, or lens; but more frequently it passes into the posterior chamber.[7] The wound made by the entrance of the fragment generally heals without difficulty, so that in a few days it is sometimes not easy to detect it, especially if it has been in the sclerotica. Immediately after the accident, the changes produced are so like those observed in penetrating wounds of the eye, when no foreign body remains in it, that it is impossible to ascertain, at first, whether the cap is in the eye or not. Vision is more or less affected immediately after the injury, according as the lens, retina, and other structures are implicated.

Severe inflammation sometimes sets in immediately, the iris becomes of a greenish hue, the lens grows opaque, and there is great pain. If the cornea is now laid open, with the view of extracting the foreign body, pus flows from the interior of the eye. It not unfrequently happens, however, that for a length of time, varying from a few days to a month after the accident, the eye appears to be recovering; but at the expiration of that time, it is suddenly seized with most acute pain, attended with chemosis, and sometimes with haziness of the cornea. In a day or two, the pain may become mitigated, or for a while it may entirely subside; but this cessation is only temporary. The pain recurs and subsides at uncertain periods, until the vision of the injured eye is entirely destroyed. The eyeball is left in a state of chronic inflammation, and the health of the patient is much affected by the long-continued irritation occasioned by the injury, the depletory and reducing treatment used, and the anxiety he is under for his sight; for at this stage the vision of the other eye becomes affected by the inflammation extending to it by sympathy.

Mr. Barton, of Manchester, thinks that the sympathetic inflammation, in those cases, is occasioned by the presence of a fragment of cap in the injured eye, and that the only means of preventing such inflammation, or of allaying it when it has arisen, is the removal of the fragment. He has treated many cases on this principle, which appears to be perfectly just.

The patient being placed in a convenient position, and brought into a state of insensibility by the inhalation of chloroform, the operator forms, by means of Beer's knife, a large flap of the cornea. The knife may now be directed through the pupil and lens, so as to give an opportunity for the lens to come away, along with part of the vitreous humour, and perhaps the fragment of cap. If there is no appearance of the foreign body in what is discharged from the eye, the flap of the cornea is to be seized with a pair of forceps, and cut away with curved scissors. A dose of laudanum is then given, and a linseed-meal poultice applied over the eyelids. If chloroform is not used, the operation, being very painful, must be performed as rapidly as possible. The eye is so exceedingly sensitive, that attempts to search for the fragment of the cap cannot be endured. In all Mr. Barton's cases, the cap was found in the poultice, or in the coagulum which closed the opening into the eye, one or more days after the operation.

The fragments of caps taken from the eye, after being within it for months, were only tarnished; they bore no appearance of undergoing changes similar to those which take place in pieces of steel during their exposure to the humours of the eye; they were always of considerable size, and their angles sharp.[8]

The same practice may be extended, with good effects, to other cases of foreign substances lodged within the eye.

4. The eyeball most frequently bursts in cases where it is struck by musket-shot; but occasionally it escapes with apparently little injury, the ball penetrating between the eye and the orbit. Exophthalmia, or inflammatory disorganisation of the eye, with protrusion, is very apt to follow in either of these cases. When this symptom does occur, either the humours should be evacuated by a free and deep incision, so as to allow the eyeball to shrink and become quiet; or, if it has become solid from thickening of its coats, it ought to be extirpated. If such practice is not followed, the patient is generally doomed to suffer extreme pain for a length of time; and the enlarged eyeball is even apt, by pressure, to produce absorption of the roof of the orbit, and fatal inflammation of the dura mater and brain.

5. What is styled the *wind of a ball* has been known to produce amaurosis.

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[1] Lectures in the Lancet; Vol. ix. p. 531; London, 1826.

[2] Traité des Maladies des Yeux; Planche 52, fig. 1; Paris, 1818.

[3] Ibid.; Tome ii. p. 503.

[4] Annales d'Oculistique, Tome iii. p. 73; Bruxelles, 1840.

[5] Medical Gazette; Vol. xiii. p. 888; London, 1834.

[6] Edinburgh Medical and Surgical Journal; Vol. xliv. p. 106; Edinburgh, 1835.

[7] See case by Laurent and Cunier, in which the whole of an exploded cap was extracted from the anterior chamber, Annales d'Oculistique, Tome i. p. 433; Charleroi, 1839.

[8] On Injuries of the Eye by Percussion Caps, see Crompton, Medical Gazette; Vol. xxi. p. 175; London, 1837. Case of a fragment fixed in the lens, by Stiévenart, Annales d'Oculistique, Tome i. p. 439; Charleroi, 1839. Fixed in the Iris and extracted, by Cunier; Ibid. p. 440. Extracted from the vitreous body, in Barton's method, Walker's Oculist's Vade-mecum, p. 323; London, 1843.

SECTION IX. — DISLOCATION OF THE EYEBALL.

I have already had occasion (pages 13, 14), to quote two cases of dislocation of the eyeball, by foreign substances thrust between the eye and the orbit; and I have explained, that by being dislocated, is to be understood that the eyeball is extruded beyond the fibrous layer of the eyelids. The optic nerve, with the eye in that state, is put on the stretch, the lids can no longer be brought together, and vision is in general lost till reduction is accomplished. Such an accident is most likely to happen to those who have the eyeballs large and the orbits shallow; for, in such persons, it is possible, by pressing the lids above and below, to get a view, not merely of one half of the eye, but partially even of the back of it.

If the foreign body by which the dislocation has been produced be still in the orbit, it must, of course, be removed before reduction be attempted. After this is effected, the eye is to be pressed steadily back into its place. The pressure being continued for some time, the eyeball will generally be found to start suddenly back into the orbit, and vision to be immediately restored.

From the obliquity of the base of the orbit, it is evident that towards the temple the eyeball stands in a considerable degree exterior to that cavity; and hence it is that a severe blow on the eye, for instance, with a racket ball, is capable of producing dislocation. Covillard, in his *Observations Iatro-chirurgiques*, relates a case of this sort. He tells us that the dislocation was so complete, that when he arrived, immediately after the accident, he found one of the patient's friends with scissors in his hand, ready to cut the eye away. Covillard reduced it, and the patient's vision was preserved.[1]

Case 263. — A corn-porter, returning home intoxicated, and staggering about his room, struck his right eye against a small iron hook or nail in a dresser, which, entering at the outer angle of the upper lid, drove the eye from its socket. Brought by his wife to Mercer's Hospital, Dublin, at half-past 12 at night, he was very unruly, and holding a large check apron close up to his eye, he kept constantly rubbing and pressing it. Dr. Jameson found the eyeball out of the orbit, firmly fixed, and immoveable, elastic to the touch, and devoid of all power of vision. The cornea was dry, and rather opaque, the pupil moderately contracted, and uninfluenced by the light of a candle. The reflection of the conjunctiva from the lid to the globe was partially torn through. The margin of the upper lid was not visible, being behind the globe, and spasmodically contracted.

Restraining the patient with difficulty, Dr. Jameson, with two fingers of his left hand, elevated the upper lid, pressing at the same time with the fingers and thumb of his right on the ball of the eye, which was immediately drawn back with a snap, the lids closing over it.

In a few days, after cold applications, venesection, and a purge, the patient was dismissed cured, vision being complete.[2]

Weld mentions[3], that at Richmond in Virginia, it was nothing uncommon to meet with persons deprived of one or both eyes from the horrid practice of *gouging*, in which the combatant, having twisted his forefingers in the side-locks of his adversary's hair, applied his thumbs so as to force the eye out of the socket.

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[1] Louis sur plusieures Maladies du Globe de l'Œil, Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 266; 12mo; Paris, 1774.

[2] Dublin Med. Press, Jan. 5. 1853; p. 1.

[3] Travels through the States of North America, by Isaac Weld, jun.; Vol. i. p. 192; London, 1800.

SECTION X.—EVULSION OF THE EYEBALL.

The eyeball is often blown out by musket-shot; but cases of its being torn out of the socket by other means are rare. A remarkable instance is related in the first volume of Gräfe and Walther's Journal. A cart-wheel went over the side of the head, and tore out the eyeball, along with 7 lines' length of the optic nerve, the muscles of the eye being left behind, and the orbit uninjured. The patient, a man of 75 years of age, recovered without any bad symptom.

Case 264.—A fisherman of Ostend, aged 49, coming home one evening very drunk, stumbled in the act of undressing himself, and fell with all his weight against the room-door. In the fall, the right orbitary region struck against the ring of the key which was in the lock of the door, and as the key was worn thin by long use, it divided vertically the upper lid, entered the orbit, and acting as a kind of lever or curette, extirpated the eye, completely severing its connections with the orbit, so that it rolled upon the floor. The patient was so drunk that he could form no notion of the severity of the injury he had sustained; but, continuing to undress himself, went to bed, and fell asleep. His wife, on rising in the morning, was astonished at the quantity of blood which her husband had lost from a wound of the lid, apparently slight; but her astonishment changed to fear, when she found on the floor an eye.

Dr. Verhaeghe, who was immediately sent for, found the man in bed, his clothes saturated with blood, the upper lid divided to the extent of six lines, the orbit filled with coagula, and portions of some of the muscles of the eye hanging out between the lids. The bleeding had entirely ceased.

The eye was entire; its muscles had been torn across at different distances from their insertions into the sclerotica; the superior oblique and rectus superior were so at three quarters of an inch. The optic nerve was divided at about an inch from the sclerotica. The key was bent into an obtuse angle, from the fall against it of so heavy a weight.

The patient being taken to the hospital, the remains of the muscles were replaced in the orbit, and the wound of the lid united by a stitch. Cold water dressing was applied and low diet enjoined, under which the patient speedily recovered.[1]

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[1] Annales d'Oculistique; Tome xxvi. p. 99: Bruxelles, 1851.

CHAPTER XIII.

THE OPHTHALMIÆ, OR INFLAMMATORY DISEASES OF THE EYEBALL AND CONJUNCTIVA.

SECTION I.—THE OPHTHALMIÆ IN GENERAL.

UNDER the term *inflammation* is included, first of all, that state of parts characterised by *increased redness*, *unnatural heat*, *swelling*, and *pain*. This state, indeed, is generally regarded as strictly inflammation, denoted by its four primary phenomena. The morbid changes which I shall presently enumerate, are considered as so many secondary phenomena, apt to succeed, but which do not necessarily succeed to this, the first stage of every inflammatory disease. So long as the part affected exhibits nothing else than increased redness, unnatural heat, swelling, and pain, and so long as these continue to augment, the disease is merely developing itself. An inflammatory attack having perhaps reached the greatest degree of violence of which this first stage is susceptible, may, without any new local phenomena being manifested, gradually subside through the means employed for its cure, or by the natural *resolution* of the disease.

On the other hand, the disease may go on, and manifest, with greater or less rapidity, one or more of the following seven secondary phenomena of inflammation—namely, *effusion* or *exudation; adhesion; suppuration; ulceration; mortification; granulation;* and *cicatrization.* Effusion or exudation may consist either of serum, of liquor sanguinis, yielding coagulable lymph or fibrine, or of red blood. Suppuration may either take place upon a secreting surface, or form an abscess within the texture of the part affected. The part inflamed may pass through several of these states in succession, or several of them may exist together at the same time.

There is also a tertiary set of inflammatory phenomena, depending on the secondary; such as, *opacity*, *insensibility*, *change of form, hypertrophy*, *atrophy*, *induration*, *softening*, &c.[1]

Inflammation, in whatever part of the body, and consequently in whatever part of the eye it originates, may terminate in any of the processes now enumerated. Even those parts which in their normal state are destitute of vessels, as the cornea, the crystalline, or the vitreous body, suffer from inflammation, and exhibit similar changes to those which occur in structures directly supplied with blood.

The secondary and tertiary phenomena of inflammation are always modified by the structure of the part affected. Every different texture of the eye, possessing both physical and vital properties peculiar to itself, suffers differently from the several processes of inflammation. In general, the modifications of inflammation from differences of texture in the parts affected, are displayed with much distinctness in this organ; in some cases, however, these modifications can be judged of only from their consequences, and by minute observation of the derangement which remains in the organisation, or in the function, of the part which had suffered; while in other cases, from the delicate texture of the part, or its hidden situation in the eye, the modifications in question may escape detection.

The conjunctiva, sclerotica, cornea, iris, and retina, present a series of the modifications of inflammation, to which I have just now referred, sufficiently distinct to convince the most sceptical of the truth of what I have been asserting, and sufficiently striking to rouse the most inattentive to research. The muco-cutaneous conjunctiva secreting a flood of purulent matter, as in the contagious ophthalmiæ—the fibrous sclerotica affected for months with rheumatic inflammation—the cornea losing entirely its transparency, becoming infiltrated with pus, or destroyed layer after layer by a penetrating ulcer—the iris pouring out coagulable lymph, and this lymph forming the medium of morbid adhesions, so that the pupil is deprived of its natural power of expanding and contracting—the retina, without any manifestation of pain, losing in a few hours all sensibility to its natural stimulus,—these are facts in which are displayed some of the modifications of inflammatory action more distinctly and strikingly than they are manifested in any other part of the body.

Each organ of the body, when inflamed, besides more or less of the general signs of inflammation, manifests certain symptoms which are peculiar to itself. Thus, intolerance of light and lacrymation are special symptoms afforded by the eye, and bear a similar relation to the functions of this organ, as difficulty of breathing does to the lungs, or delirium to the brain. Even such special symptoms, however, are modified, according to the particular texture of the eye which is inflamed.

There are other circumstances besides differences of texture which modify the inflammatory affections of the eye, rendering also this subject very extensive in the discussion, and causing the diseases to be occasionally very perplexing in the treatment. They are under the influence of peculiarities of constitution, and of constitutional diseases, and are subject to innumerable variations from the influence of sympathies. Scrofula, syphilis, and gout are each of them capable either of exciting inflammation in different parts of the eye, or of communicating to an inflammation, excited by other causes, such differences in character, as often to render it difficult to recognise a disease, with which we are well acquainted in its simple or idiopathic form.

The general rule, established by pathological observations of every part of the body, that inflammation in a great measure limits itself not merely to one organ, but even to one tissue, certainly holds with regard to the eye. As we have bronchitis, pneumonia, and pleuritis, designating inflammation of the various tissues of the lungs, and as we meet with inflammation of the peritoneum, of the proper substance of the bowels, and of their lining membrane; so we find the different tissues of the eye separately affected, obliging us to recognise conjunctivitis, sclerotitis, iritis, and the like, as individual diseases.

By the influence of local sympathy, however, inflammation of one texture of the eye never takes place without extending, in some degree, to the textures with which the first affected is in contact. By the same influence, inflammation originating in one texture of the eye is communicated to several of the other textures, the disease of the superficial tunics being communicated to those more deeply seated, and conversely that of the internal parts spreading outwards; and, while each texture obeys its own laws of morbid action, the whole organ in this way may become involved by what had at first a very limited existence, and perhaps a very trivial aspect.

We speak of conjunctivitis, sclerotitis, corneitis, iritis, retinitis, and the like; but it must be understood that the inflammation in none of those affections is confined to the particular texture indicated by the name. The disease commences, indeed, and has its chief seat in the particular texture indicated; but the neighbouring parts are always more or less involved. Thus, in iritis, the membrane of the aqueous humour, the crystalline capsule, the sclerotica, the conjunctiva, the choroid, and even the retina, are affected; so that *iritis* is an abbreviated mode of expressing an inflammation which in general involves almost the whole textures of the eye. The iris, however, is the focus of the morbid action; and the part, which from its situation, its functions, and the morbid changes which it undergoes, exhibits the most striking signs of the disease, the chief indications for treatment, and the most remarkable effects of the remedies employed.

We are not to suppose, even in those ophthalmiæ, the focus of which is one or other of the exterior textures of the eye, and which we designate therefore by such names as conjunctivitis, corneitis, or sclerotitis, that the internal textures do not suffer. Dr. Rognetta relates[2], that an old man, who had some short time before been attacked with an apparently slight conjunctivitis of one eye, accompanied by photophobia, having died, in one of the Parisian hospitals, of inflammation in the chest, he dissected the eye, and found, to his astonishment, all the internal tissues inflamed ; even the hyaloid and the retina were red. The same author has remarked[3], that many chronic cases of ophthalmia, seemingly of no great severity, but refractory to ordinary treatment, depend on a habitually congestive state of the whole vascular tree of the orbit. Even conjunctivitis is far from being a simply tegumentary or external affection.

When we reflect, then, on the innumerable combinations which may take place among the inflammatory diseases of the eye, and the many causes by which these diseases may be modified, we shall be convinced, I think, that of all the subjects requiring descriptions and explanations of morbid actions and changes, there can be few more difficult than those diseases which have been swept together with so indiscriminating a hand under the name of *ophthalmia*. To consider these actions and changes individually, and only in a single texture of the eye at once, may seem to lessen the difficulty ; for instance, to consider inflammation of the cornea, and to exhibit to ourselves in order, effusion of serum, effusion of coagulable lymph, secretion of pus, formation of abscess, ulceration, mortification, and cicatrization, according as each of these processes manifests itself in the cornea. But to do all this is to consider and to exhibit what never takes place separately in nature. Unless this be kept in mind by those who begin to study the inflammatory diseases of the eye, they will be not a little perplexed by the diversified complications of morbid phenomena, which they will meet at every step of their progress.

A knowledge of the inflammatory diseases of the eye has been greatly retarded by the practice of confounding them all under the general name *ophthalmia*, and thus overlooking both the seat of the disease, and the peculiar nature of the inflammation. The consequence of thus viewing all these diseases without discrimination, has been a method of treating them equally preposterous. In fact, in the practice of those who have had no opportunities of properly studying the diseases of the eye, the same routine of remedies is used in every case in which the eye appears inflamed ; and it often happens, that it is not till this routine is exhausted, and the eye in some of its essential parts becoming seriously disorganised, that a suspicion arises of there being something peculiar or specific in the case. Even from the slight view which we have already taken of the subject, it is evidently impossible that the inflammatory affections of parts so widely differing in structure and function as those combined in the eye, can be treated at once indiscriminately and successfully. We find, for example, that the remedies which in the course of a few days are often sufficient completely to remove inflammation of the conjunctiva, only aggravate inflammation of the sclerotica or iris; while the plan of treatment which speedily cures sclerotitis or iritis, if trusted to in conjunctivitis, would expose the eye to almost certain destruction. Great advantages will accrue, then, from the adoption of an accurate classification of the ophthalmiæ. One advantage of no inconsiderable moment will be, that we shall conduct our examinations of the inflammatory diseases of the eye which may come under our care, with much more accuracy than we could possibly do, were we to employ the vague nomenclature in common use. Having noted exactly the disease which is before us, we shall be able both to ascertain to our own satisfaction, the effects of the remedies which we employ, and to communicate our experience to others, which, without a just classification and perspicuous nomenclature, it is utterly impossible to do.

Into the following table the name of no disease is admitted, the distinct and separate existence of which I have not either ascertained in the course of my own observations, or been convinced of upon good authority. It is not offered as a complete, nor as a strictly scientific classification of the inflammations of the eye, but as a mere enumeration bearing chiefly upon practical views. It would be an easy task to increase the catalogue of the ophthalmiæ, especially of their subspecies and varieties. The reader who chooses to see how far this sort of thing may be carried, I would refer to a paper on Corneitis, by Dr. Schindler, in the third volume of Ammon's Monatsschrift. Each texture of the eye might easily be exhibited in the same way, under an endless variety of nosological distinctions, a plan quite inconsistent with the nature of a work, the object of which is to describe those aggregated phenomena which are most commonly met with in practice.

I. CONJUNCTIVITIS.

I. CONJUNCTIVITIS SIMPLEX.

II. CONJUNCTIVITIS PURO-MUCOSA.

1. Conjunctivitis catarrhalis.
   a. *Sporadic.* b. *Epidemic.* c. *Miasmatic.*
2. Conjunctivitis purulenta *vel* contagiosa. (Egyptian ophthalmia.)
3. Conjunctivitis purulenta neonatorum.
   a. *Catarrhal.* b. *Leucorrhœal.* c. *Gonorrhœal.* d. *Traumatic.*
4. Conjunctivitis purulenta gonorrhoica.

III. CONJUNCTIVITIS ERUPTIVA.

1. Conjunctivitis aphthosa *vel* pustulosa.
2. Conjunctivitis phlyctenulosa. (Scrofulous ophthalmia).
3. Conjunctivitis erysipelatosa.
4. Conjunctivitis morbillosa.
5. Conjunctivitis scarlatinosa.

The conjunctiva suffers in various other cutaneous diseases; as, in syphilitic lepra, purpura, pompholyx, variola, herpes, elephantiasis, &c.

II. SCLEROTITIS.

I. SCLEROTITIS IDIOPATHICA. (Rheumatic ophthalmia.)

II. SCLEROTITIS SCROFULOSA.

III. CORNEITIS.
- 1. Corneitis idiopathica.
- 2. Corneitis scrofulosa.
- 3. Corneitis postvariolosa. (Variolous ophthalmia.)
- 4. Corneitis arthritica.

IV. IRITIS.
- 1. Iritis idiopathica *vel* rheumatica.
- 2. Iritis syphilitica. (Syphilitic ophthalmia.)
- 3. Iritis syphiloidea.
- 4. Iritis gonorrhoica.
- 5. Iritis scrofulosa.
- 6. Iritis arthritica. (Arthritic ophthalmia.)

V. AQUO-CAPSULITIS.

VI. CHOROIDITIS.

VII. RETINITIS.
- 1. Retinitis idiopathica.
- 2. Retinitis lactantium.

VIII. CRYSTALLINO-CAPSULITIS et CRYSTALLINITIS.

IX. HYALOIDITIS.

X. OPHTHALMITIS.
- 1. Ophthalmitis idiopathica. (Ocular phlegmon.)
- 2. Ophthalmitis phlebitica.
- 3. Ophthalmitis postfebrilis.
- 4. Ophthalmitis reflexa *vel* sympathetica.

APPENDIX.

1. Compound ophthalmiæ, as, the scrofulo-catarrhal, catarrho-rheumatic, &c.
2. Traumatic ophthalmiæ.
   Under this head, might be enumerated conjunctivitis traumatica, corneitis traumatica, iritis traumatica, and so on.
3. Artificial ophthalmiæ.
4. Intermittent ophthalmiæ.

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[1] Pathologists have recently directed much of their attention to the nature of the process by which the phenomena noticed in the text are produced, or, in other words, to the theory of inflammation.

Microscopical observations show that the redness of inflammation is owing to an accumulation and stagnation of the red corpuscles of the blood, in the extreme arteries, capillaries, and radicles of the veins of the affected part. The red corpuscles, thus stagnant within the minute blood-vessels, appear as if fused into a uniform mass.

The immediate cause of the accumulation and stagnation of the red corpuscles has been supposed to be a retardation of the flow of blood, arising from dilatation of the small arteries; but it has been shown by the observations of Mr. Paget and Mr. Wharton Jones, that so far from retardation being the result of dilatation of the small arteries, acceleration of the flow of blood invariably takes place. From his observations on the bat and frog, Mr. Wharton Jones has shown that the first establishment of accumulation of red corpuscles in the capillaries is owing to constriction of the small arteries leading to the part, whereby the red corpuscles are no longer subjected to the *vis à tergo*. The accumulating corpuscles at the same time, by virtue of their attractions, become aggregated together, and adherent to the walls of the vessels.

The constriction of the small arteries is owing to the irritation of the exciting cause on the nerves of the arteries. But subsequently, relaxation of the walls of the arteries, with dilatation, may take place from suspension of nervous influence. The effect of this may be re-establishment of the circulation, and resolution of the inflammation. If the stagnation, however, is already to any great extent, resolution will not so readily take place, but, on the contrary, the inflammation may be aggravated. The increased pulsation which occurs at this time is owing to the diminished contractile power of the arteries, permitting their walls to yield easily to the impulse of the heart.

Exudation or effusion follows on stagnation; the effused matter being first serous, and afterwards consisting of liquor sanguinis, and therefore lymphatic or fibrinous. When extravasation of red corpuscles takes place, this is owing to giving way of the walls of some vessels.

The general mass of blood, when the inflammation of any part is severe, shows an increase in the quantity of fibrine, and a decrease of red corpuscles; and the result of this is the appearance called the *buffy coat*, in blood drawn from a vein.

When resolution takes place, there is dilatation of the small arteries, and a loosening and breaking up of the agglomerated red corpuscles, whereby they yield anew to the *vis à tergo*, and are carried along in the circulation. By and by, the vessels recover their usual calibre, and the nervous influence returns.

Adhesion is the result of a change in the effused lymph or liquor sanguinis, by which it becomes coagulated, while there are formed in it, as in a blastema, the elements of areolar tissue and blood-vessels.

A different kind of organic element, namely, the pus-globule, capable of no further development, being formed in the effused matter, the result is suppuration. Suspended in a fluid, called the liquor puris, pus-globules may undergo absorption, but are more frequently discharged on the mucous surfaces of the body, or, collecting so as to form an abscess, escape by a perforation of the integuments.

Mortification is the death of the inflamed part, of the blood stagnant in it, and of the effused matter. Ulceration is a variety of mortification, in which the dead tissues are thrown off in minute molecules, instead of separating in the form of a large slough.

The reparation of parts which have suffered from mortification or ulceration is styled granulation, and is accomplished by the development of areolar tissue and vessels in the effused fibrine, by which the parts are invested, and which is more or less covered by pus. The round bodies called granulations, on the surface of a healing sore, examined with the microscope, are found to consist of cells of various shapes, and in different stages of development into the above-named tissues.

The healing process is completed by cicatrization, or the investment of the part with a new epidermis or epithelium.

SECTION II. — REMEDIES FOR THE OPHTHALMIÆ.

Before proceeding to describe the different inflammations of the eye, and explain the treatment particularly required for each, it may not be improper to offer a few rules of universal application in the treatment of these diseases, and to make some general remarks on the classes of remedies employed for their cure.

General rules. — 1. It is a general rule of great importance in the treatment of any ophthalmia, to discover the cause whence it has arisen, and, if possible, to remove that cause, if it is still in operation. The cause may be local, or it may be constitutional; but in any case, if it be allowed still to operate, it is evident that everything in the way of remedy must prove comparatively or entirely ineffectual.

2. In treating the various forms, varieties, and degrees of the ophthalmiæ, it is an essential object to have a clear conception of the accompanying constitution; for without rectifying the state of the constitution, we shall often fail in curing the attending local complaint. The previous diseases, also, of the patient should be ascertained.

3. The eye, and the body at large, must be defended from new sources of irritation. The original cause may be removed, but the disease may still continue, being kept up by other causes, of a nature

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[2] Cours public d'Ophthalmologie, Lancette Française, 9 Février 1837.

[3] Annales d'Oculistique, 1^er vol., Suppl. p. 47; Bruxelles, 1842.

very different from the original one, but equally detrimental. The primary cause is often local, and the secondary causes constitutional. After the first is removed, the second are liable to be overlooked.

4. As the exercise of the function of the eye would be a source of considerable excitement to it when suffering under inflammation, rest of the organ ought generally to be enjoined. It is necessary even to exclude the light, in most instances, by the use of a shade over both eyes. But this is not proper in every case. On the contrary, we are obliged sometimes to encourage patients to admit the light, and even to use the eyes. In some cases rest of the body is indispensable, especially in the acute stage of the internal ophthalmiæ.

5. It is of great moment to examine the diseased organ carefully, and thoroughly, from time to time; in some cases daily, or even oftener. Many children lose their sight in the puro-mucous ophthalmiæ, no examination of their eyes ever being made, till the corneæ are destroyed. The practitioner must never decline the examination of the eyes, from any real or fancied difficulty.

Remedies.—The remedies which may occasionally be required for the cure of the ophthalmiæ are very numerous; those which are most frequently used, and in general with complete success, are few and simple. They are not all, however, of one kind, but of very different kinds. Nay, for the same species of ophthalmia, as will be seen by and by, remedies of diametrically opposite effects are found useful. Common sense will dictate that it is not meant to employ discordant remedies together, nor even perhaps one after the other in the exact order in which they are enumerated. Particular circumstances of the case must often determine the choice of the remedies.

1. *Blood-letting.* Opening a vein of the arm, applying leeches round the eye, and dividing the inflamed conjunctiva, are the three modes of taking away blood commonly had recourse to in this class of diseases. Opening the temporal artery, the external jugular vein, or the nasal vein, or cupping the temples, is seldom necessary. The three modes of bleeding first enumerated cannot be substituted one for another, and we should often run a risk of losing the eye, were we to attempt to cure by local, what will readily yield to general bleeding, and *vice versâ.* For instance, bleeding at the arm, by depressing too much the general strength of the patient, rather aggravates in general than alleviates the scrofulous ophthalmiæ, while bleeding with leeches, by removing local turgescence, greatly relieves them; a check is readily put to most of the internal ophthalmiæ by general blood-letting, while local has comparatively but little effect; in chronic puro-mucous conjunctivitis, much more good is done by scarifying the inside of the eyelids, than could be accomplished by leeching or phlebotomy. Neither is it unimportant in what order of succession we employ these three modes of taking away blood. Leeching, for example, when considerable synocha is present, produces much more effect if preceded by general bleeding; and especially if the leeches are applied within a few hours after the impetus of the circulating system has by that means been moderated.

There is no inflammatory disease of the eye which is curable by bleeding alone. I regard as foolish, the attempts to cure the contagious or Egyptian ophthalmia by taking away blood from an artery or vein in very large quantities, or till the inflamed membrane grows pale from depletion ; *first*, because even were this paleness produced, it would be no test of the disease being subdued; *secondly*, because a degree of blood-letting sufficient to produce even an approach to such an effect, would leave the patient in a state of great and unnecessary debility ; and *thirdly*, because the disease can be cured by a milder plan of treatment. All the ophthalmiæ require other remedies besides the taking away of blood ; and, therefore, while we value this means of cure very highly, we must by no means trust to it alone in any case. When practitioners placed their sole reliance on depletion in the purulent ophthalmiæ, the results were truly disastrous.[1]

In taking away blood from the arm in any inflammatory disease of the eye, the opening should be made large, so as to insure, if possible, a considerable effect on the impetus of the circulation. The quantity to be removed will vary from 10 to 20 or 30 ounces, according to the constitution of the patient, and the circumstances of the disease.

Leeches ought to be applied, in general, rather over the nasal vein, on the temple, or forehead, or behind the ear, than on the loose skin of the eyelids. The number applied may vary from one to twenty or more. Two or three over the nasal vein will do as much good as twice that number on the lids. A leech-glass assists in placing them on the spot indicated. In infants, we often find much good effected, by one leech on the middle of the upper eyelid ; and in some chronic cases of inflamed and thickened conjunctiva, one or two on the internal surface of the lids prove useful. Leeches to the mucous membrane of the adjacent nostril unload the vessels of the eye, and especially of the conjunctiva. It has been proposed in variolous ophthalmia, and some other cases, to continue for a number of hours in succession a discharge of blood by leeches behind the ears ; as soon as one set drop off, supplying their place by others. This is termed by the French applying leeches *en permanence.*

I by no means deny the efficacy of opening the temporal artery, or taking away blood by scarifying and cupping the temples; but these modes are more difficult of execution, and are attended with a greater degree of irritation and pain than simple venesection, and the application of leeches. They also preclude, in many instances, the use of other means which are likely to be useful ; as, blisters to the temple and behind the ear. The tight bandage necessary after arteriotomy is also objectionable in cases of ophthalmia, the painful degree of pressure, and the development of heat, which it produces, being apt to increase the uneasiness of the eye and head. Where general blood-letting is necessary, as in iritis, cupping cannot be trusted. It does not produce the same effect on the momentum of the circulation as phlebotomy. I have seen many patients who owed the loss, or at least the irreparable deterioration, of their sight, to their having been merely cupped for iritis, when they should have been bled at the arm. Twelve or fifteen ounces of blood, taken by a pretty large opening from the bend of the arm, has much more effect in checking any of the internal ophthalmiæ, than twice that quantity taken by cupping. We always find the blood buffy in iritis, especially syphilitic iritis, and often require to open a vein in the arm three or four times before the disease is subdued. Trust such cases to cupping, and the pupil is probably left contracted, the sensibility of the retina impaired, or the eyeball flexible from a state of commencing atrophy!

Scarification of the conjunctiva of the eyelids, and sometimes of that covering the eyeball, is, in certain cases, a valuable means of cure, from which we are not to be deterred by the theoretical notion, that the infliction of mechanical injury on a part already actively inflamed cannot be advantageous. Ample experience convinces me that scarification is useful, not only when inflammation of the conjunctiva is on the wane, but often even in the acute stage, and especially when considerable chemosis is present. One or two incisions of the conjunctiva, with a lancet, the point of which is rounded off, being made along the whole length of the inner surface of either eyelid, a very considerable discharge of blood will probably take place, and if the lids be properly managed, blood will continue to flow for a considerable time. For this purpose, the lid ought neither to be held constantly everted till the bleeding ceases, nor allowed to fall back into continued contact with the eyeball, in either of which ways little blood will be obtained; but the lid ought to be alternately everted and permitted to return to its natural position, by which means the divided vessels are refilled, and thus a prolonged flow of blood is insured. A bit of sponge wrung out of hot water is to receive the blood, but not to touch the incision, unless when the blood seems to be about to cease flowing, when the coagula may be wiped away, to make the wound bleed again.

Scarification of the conjunctiva covering the eyeball, has generally been performed by incisions concentric with the edge of the cornea; but Mr. Tyrrell suggested[2] that it was better to make the incisions in a radiated direction from the cornea, and corresponding to the intervals between the insertion of the recti muscles. He recommended this plan in acute purulent ophthalmia, a disease in which the conjunctiva is generally much swollen. He thought that in the common method of scarifying the eyeball, the vessels passing to the corneal portion of the conjunctiva must be in great part, if not entirely divided, and the tendency to destruction of the cornea thereby augmented; whereas in the method of scarifying which he suggested, the principal vessels of the conjunctiva bulbi should not be injured, and yet the loaded state of the membrane should be relieved. Unfortunately, however, in severe cases, where there is much chemosis, the lids are generally so swollen as to render it impossible to make the radiating incisions which he described.

Along with scarification, we may class the snipping across of individual enlarged vessels, running over the surface of the eyeball, which is sometimes useful, but not unfrequently employed when quite unnecessary. The mode which I find most efficacious, is to raise a small fold of the conjunctiva with the forceps, and snip it through with the scissors. This fold rarely contains the enlarged vessel which we wish to cut across, but it is now exposed; with a small hook it is easily raised from the surface of the sclerotica, and then divided.

The practice of removing with the scissors a circular portion of the conjunctiva round the edge of the cornea, as was advised by Scarpa[3] in cases of nebula, appeared to have been almost entirely laid aside, when it was revived by Sanson, as a means of treating gonorrhœal ophthalmia. He excised, by means of forceps and scissors, the ocular conjunctiva, and immediately afterwards cauterized the palpebral conjunctiva with the solid nitrate of silver.[4] I conceive such excision to be an unnecessary measure; besides, it is in acute cases almost impracticable, on account of the great swelling of the lids, and their state of tension from the swollen condition of the conjunctiva. When the swelling has subsided, so as to make the operation practicable, a cure can be effected without it. If accomplished, symblepheron appears not unlikely to follow.

2. *Paracentesis corneæ*, or *evacuation of the aqueous humour*, has been highly recommended by Mr. Wardrop[5], as a mode of depletion in some kinds of ophthalmia. Although in certain cases an invaluable remedy, it is rather too nice an operation to have come into general use.

The opening through the cornea, by which the aqueous humour is to be discharged, may be made with any of the knives commonly used for extracting the cataract, or with a broad iris-knife. It is sufficient that the point of the instrument be introduced so that it makes a puncture into the anterior chamber; this should be done at the distance of $\frac{1}{10}$ inch from the sclerotica, at any part of the circumference of the cornea. When the knife has penetrated into the anterior chamber, it may be withdrawn a little, and the blade turned on its axis, when the aqueous humour will readily escape. It is better not to remove the instrument altogether, till the fluid is observed to be discharged; for if the incision be not sufficiently large, and the knife taken away before the aqueous humour flows out, the elasticity of the cornea closes the wound, and either hinders the evacuation from being so sudden, and consequently so efficacious, or entirely prevents it. The operation, therefore, which is necessary to discharge the aqueous humour, is merely the first step of the section of the cornea, made in extracting the cataract, or what is called the *puncturation*.

The chief difficulty in performing the operation, arises from the pain occasioned by the necessary pressure on an inflamed eyeball whilst keeping open the eyelids; but until a sufficient portion of the cornea is brought into view, and the eye completely under the management of the operator, the introduction of the knife should not be attempted. The upper lid should be elevated by the fingers of the assistant, or by the retractor (*Fig.* 41, p. 363); while the operator, with the fore and middle fingers of the hand which does not hold the knife, presses down the lower lid, applying their points over its edge, in such a manner that they touch the eyeball, and can be made to exercise any degree of pressure upon it which may be necessary. Before the assistant raises the upper lid, the patient should be directed to look downwards; and then the assistant employs a sufficient pressure to keep the eye in that position.

As the patient is very apt to start when he first feels the instrument coming in contact with his eye, it is useful to touch the cornea repeatedly with the back of the knife till all risk of starting is over; and as soon as its extremity rests on the part where the puncture is to be made, the knife may readily be raised on its point, and carried into the anterior chamber.

3. *Anæsthetics.* As a valuable means of reducing inflammation in different textures of the eye, and of relieving the pain and intolerance of light which attend some of the ophthalmiæ, may be mentioned the inhalation of the vapour of sulphuric ether or of chloroform. Bringing the patient for a few minutes into the insensible state, by means of one or other of these agents, gives marked, and often permanent relief, in scrofulous conjunctivitis, corneitis, and sympathetic ophthalmitis. The inhalation should be practised while the patient lies supine, and may be repeated daily or every second day.[6]

4. *Purgatives* act in two ways in the cure of the inflammatory diseases of the eye; namely, as depletory, and as sympathetic means. They reduce the quantity of circulating fluid, as well as remove the contents of the bowels, and from the continuity of the investing membrane of the eye with the lining membrane of the alimentary canal, they prove a very effectual remedy in almost all kinds of ophthalmia. An active purge of calomel and jalap is often sufficient of itself to check an attack, when employed early. In the course of diseases of this class, occasional laxatives are always necessary; while in many cases, especially in children, nothing but a continued use of purgatives will effect a cure.

5. *Emetics* and *nauseants* are of essential service in the treatment of various inflammatory affections of the eye, not only when there is reason to suppose that an overloaded state of the digestive organs is concerned in keeping up irritation, but as a means of lowering the circulation, and relaxing the skin.[7] In chronic cases, the sorbefacient effects of this class of remedies are also highly useful, promoting the absorption of unhealthy depositions, and thus assisting in restoring the transparent front of the eye to its natural condition.

6. *Diaphoretics* are useful in lowering inflammatory action in the eye, especially when suppressed perspiration has been, as it often is, the exciting cause of an ophthalmia The eye, being invested by a continuation of the integuments, partakes in the good effects of a renewed secretion from the skin. We seldom indeed think of treating any ophthalmia by diaphoretics alone; but after depletion, we employ this class of remedies as valuable adjuvants in the cure. Under this head, may be mentioned the warm pediluvium at bed-time, and the tepid and warm bath.

7. *Sorbefacients.* The efficacy of mercury in inflammations of the eye has long been established.[8] Without the aid of this medicine, we might regard the internal ophthalmiæ, and especially inflammation of the iris, as nearly incurable. It is chiefly as a sorbefacient that mercury proves so useful in the internal ophthalmiæ, powerfully promoting the removal of effused coagulable lymph, by an increased

action of the absorbents. Whether it accomplishes this directly, by actually stimulating the absorbents, or merely favours their action, by abating in some unknown mode the inflammation, in which the effusion originates, we are unable to say; but the sad result of the internal ophthalmiæ, when neglected, and the admirable effect of mercury, in preserving the open and transparent state of the pupil, in these diseases, are placed beyond all doubt.

In the diseases to which I have alluded, we employ mercury, so as to affect the constitution, and in this way to operate on the eye; but in other cases we use it in smaller doses, in the expectation of deriving benefit from its well-known effects on the secretory organs concerned in digestion.

The iodide of potassium may often be employed with advantage, in cases where mercury disagrees, or when we are obliged to discontinue that medicine on account of its affecting the mouth.

8. *Tonics.* The scrofulous ophthalmiæ, and almost all others in the chronic stage, are benefited by this class of medicines, of which cinchona is by far the most powerful. The treatment of the scrofulous ophthalmiæ with sulphate of quina is an improvement in ophthalmic medicine, perhaps scarcely less important than the treatment of iritis with mercury. The former diseases are much more frequent in their occurrence than the latter, and scarcely less dangerous in their effects upon the transparent parts of the eye.[9]

The mineral acids, and the chalybeates, are also highly valuable tonic remedies for certain kinds and stages of the ophthalmiæ.

Arsenic is a tonic, and like other remedies of that class, acts by imparting a healthy energy to the capillaries. It proves useful in some chronic inflammations of the eye, attended by hemicrania. I have found it particularly serviceable in scrofulous sclerotitis.[10]

The shower bath, tepid or cold, and cold bathing generally, must be regarded as valuable remedies of the tonic class.

9. *Anodynes.* We are naturally led to employ anodynes in the hope of assuaging the pain attending many of the ophthalmiæ; but this is perhaps not their most important effect. Two of the most painful ophthalmiæ are the rheumatic and catarrho-rheumatic. Laudanum, rubbed on the forehead and temples, does much to relieve the pain; or if opium be taken internally, considerable alleviation is procured; but much more good is effected when this medicine is administered with calomel. Calomel with opium may be regarded as almost specific in the rheumatic and catarrho-rheumatic ophthalmiæ. Either remedy by itself is much less efficacious. The opium acts not merely as an anodyne, but as a dirigent, preventing the calomel from running off by stool, and insuring its being taken into the system.

Opium, in vapour, and in fomentation, is employed directly to the eye in certain states of inflammation.

Tincture of tobacco, rubbed round the orbit, proves advantageous in allaying the pain which attends some ophthalmiæ.[11]

10. *Mydriatics.* A very peculiar set of narcotics, of inestimable value in ophthalmic medicine, consists of belladonna, hyoscyamus, and stramonium, which have the power of dilating the pupil.[12] They are used in a variety of ways, but chiefly in moist extract smeared on the

eyebrow and eyelids. As in all the internal ophthalmiæ there is a disposition to closure of the pupil, one of these narcotics is applied once or oftener in the 24 hours to oppose this tendency. If severe inflammation is already present in the iris, they have little effect; but if the attack is incipient, or if it be already yielding to the influence of blood-letting and mercury, the pupil is speedily expanded.

Belladonna and hyoscyamus, employed in fomentation, vapour, or friction, or given internally, are of great use in relieving the intolerance of light and lacrymation attendant on scrofulous conjunctivitis and corneitis.[13] They also possess a remarkable power in soothing irritation, and in bringing on a healing action in ulceration of the cornea. There are few ophthalmiæ, in fact, in which benefit is not derived from the anodyne effects of this class of remedies, independently of their power over the pupil.

An elegant and convenient mode of obtaining the specific effects of belladonna, is the application to the conjunctiva of a solution of a salt of atropia. A solution even of half a grain of the sulphate in a pint of water, will dilate the pupil, when used as a lotion to the eye; but a solution of one or two grains to the ounce of water is commonly employed.

11. *Hydrocyanic acid.* If a small glass tube, open at both ends, and containing a little hydrocyanic acid, is held by a finger at each end, so that the fluid, or even its vapour only, is in contact with the skin for a few minutes, a very peculiar feeling of numbness is felt in the tips of the fingers for some time. The vapour arising from the acid, when gently heated, is presumed to be productive of the same sedative effect on the nerves of the eye, and through them on the blood-vessels. It is applied by opening the eye, for a few minutes, into a small phial, the mouth of which is shaped as an eye-cup, a few drops of the concentrated acid being previously placed at the bottom of the phial.

It is chiefly in the chronic stage of corneitis, and in opacities of the cornea, that benefit is derived from this application of the vapour of hydrocyanic acid. It appears hurtful when there is ulceration, or when there is any tendency in the eye, from injury, to fall into disorganisation.

12. *Refrigerants — Emollients.* From the abnormal feeling of heat which attends most of the ophthalmiæ, the application of cold water may be regarded as a remedy to which the patient is prompted by instinct. It undoubtedly relieves for a time, yet in the internal ophthalmiæ it is positively injurious, while in many, or even in most other cases, its use is followed by a degree of re-action which is detrimental. Incipient inflammation of the external covering of the eye may sometimes be checked by cold lotions; but even in these cases, the same good may generally be obtained from tepid applications, without the risk of any hurtful re-action; exactly as the skin in fever is cooled with less risk by the tepid, than by the cold affusion. A tepid lotion soothes and relaxes the inflamed membranes of the eye, and being evaporated at the expense of the superabundant heat of the parts, acts, in fact, as a refrigerant, as well as an emollient. Poppy decoction answers very well for this purpose.

Cataplasms applied over the eyes, though occasionally useful, often prove injurious by leading to the omission of proper remedies. Many an eye bursts under a poultice, especially in ophthalmia neonatorum, and scrofulous ophthalmia. If we order poultices, then, we must not neglect to examine, from day to day, the eye over which they are applied. Long continued, they cause a severe pustular eruption on the lids.

13. *Detergents — Astringents — Stimulants — Escharotics.* Under this head we include the innumerable substances applied to the surface of the eye, for the purpose not merely of cleaning away discharge and constringing the tissues with which they come in contact, but of influencing the vital powers of the parts. The same substance, in different degrees of concentration, may sometimes serve as a detergent, an astringent, a stimulant, or an escharotic.

In the internal ophthalmiæ, and especially in the acute stage, the application of stimulants is useless or destructive; while in conjunctival inflammations, more is effected by their means than by almost any other kind of remedy. Such astringents as alum, muriate of ammonia, sulphate of zinc, and sulphate of copper, have been in a considerable degree superseded by nitrate of silver and muriate of mercury. Acetate of lead, from the opaque and generally indelible precipitate its solution forms on any abraded or ulcerated spot of the conjunctiva or cornea, ought to be entirely dismissed from ophthalmic practice. Indeed, when an ulcer is present on the cornea, all saline solutions should be avoided, unless necessary to save the structure from disorganisation, as all of them throw down a precipitate, which adheres to the ulcer, and tends to render the cicatrice opaque. (See p. 240.)

Muriate of mercury is scarcely employed except in a very weak state of solution. In this form it is often used, as an astringent collyrium. Its solubility is generally assisted by the addition of muriate of ammonia, and the collyrium, of which it forms an ingredient, often contains also other substances, such as opium and belladonna.

Nitrate of silver is applied in solution, in salve, and in the solid form. The average strength of the solution is 4 grains to 1 ounce of distilled water, but in the treatment of the purulent ophthalmiæ, 10 grains or more may be proper. The mode of applying it is to pour about a dozen of drops into an empty wine glass, take them up with a camel-hair brush, and touch with this the inflamed conjunctiva. The solution should be spread over the upper sinus of the membrane, and not confined to the lower. The application should, in general, be repeated every eight hours. In acute cases, once a day is too seldom. The solution is immediately decomposed by the muriate of soda present in the tears and conjunctival mucus, and flows out from between the lids of a milky appearance, from the precipitation which has taken place of horn silver. Long continued, this solution tinges the conjunctiva of an indelible olive hue, and sometimes blackens permanently the cicatrice which follows its application to an ulcer on the cornea. (See p. 240.)

A nitrate of silver salve seems to have been first proposed by Dr. Ryan[14], for specks, and afterwards by Mr. Cleoburey[15] for ulcers of the cornea. Dr. Ryan used 1 drachm of nitrate of silver to the ounce of axunge; Mr. Cleoburey only 5 grains. Mr. Guthrie[16] has introduced into practice this sort of salve, of various degrees of strength, up to that of 80 grains to the ounce, not merely as a remedy for ulcers and specks, but for different ophthalmiæ, even in the acute stage. Of whatever strength it is to be, the opium which Mr. Cleoburey puts into his salve, and the liquor diacetatis plumbi which Mr. Guthrie adds to his, ought to be omitted. The nitrate of silver is to be carefully levigated in a mortar, and the fatty matter with which it is to be mixed washed with boiling distilled water, so that all foreign ingredients, and particularly common salt, may be excluded, and thus the decomposition of the nitrate in the ointment retarded as long as possible.[17]

This ointment, of the strength of 10 grains or upwards to the ounce, is applied to the conjunctiva, on the principle that no two diseases can exist together at one and the same time. The ointment, being a powerful stimulant, is supposed to excite a greater, more healthy, and more transitory degree of inflammation than that already existing. It is chiefly in the granular or sarcomatous stage of the puro-mucous ophthalmiæ that this salve is useful. In applying it, it ought not to be put in, in a lump, upon the inside of the lids, as in this way it is apt to affect only the part of the conjunctiva which it first touches, and may even produce sloughing of that part. It ought to be taken up on the point of a greasy camel-hair brush, and the lids being everted and wiped dry, the salve is to be penciled upon the palpebral conjunctiva. An immediate chemical effect is produced on the surface of the membrane, the nitrate being partially decomposed by the mucus of the conjunctiva, and reduced to the state of a chloride. Some complain but little of its effects, and are able, in half an hour or less, to open the eyes, and walk out into the street; others suffer severely for three or four hours.

Solid nitrate of silver is sometimes applied[18] to the conjunctiva of the lids in a state of inflammation, and is perhaps a more manageable remedy than the strong salve. Both these applications require to be used with great caution; as, employed carelessly, they are apt to destroy the transparency of the cornea, just as quicklime does, and to cause sloughing of the conjunctiva or of the cornea, and lead to symblepheron.

The red precipitate and the sub-nitrate of mercury are employed only in the form of salves, and these are made of various degrees of strength.

From its property of dissolving mucus and pus, a solution of potass forms one of the best detergent collyria. For this purpose, from 2 to 6 drops of aqua potassæ may be added to the ounce of water. If it is thought necessary to colour this collyrium, a few drops of tincture of catechu may be added.

A solution of tannin has been employed as an astringent application to the eye, generally of the strength of from 10 to 20 grains to an ounce of water[19], but sometimes much stronger.

A vinous solution of opium is applied either pure or diluted, and in most chronic inflammations of the eyes proves highly useful.[20] It also assists in preventing relapses. The Germans use Sydenham's liquid laudanum, which contains twice as much opium as our vinum opii. Some practitioners employ a vinous solution of opium, without aromatics.

14. *Counter-irritants*, including rubefacient liniments, blisters, and issues, are of much service in the treatment of the ophthalmiæ, especially in the chronic stage. By their means the blood-vessels of a neighbouring part, for example of the neck, are excited, those of the eye are thereby relieved, and the absorbents are thus favoured in their action. Next to the cantharides plaister, one containing tartrate of antimony is the most useful counter-irritant. Such remedies do most good when there is least fever or irritation in the system. If the counter-irritant disturbs the general health, it aggravates the local disease.

Having thus gone over the chief classes of remedies employed in the treatment of the ophthalmiæ, I may mention that much is to be effected also, in the cure of these diseases, by dietetical regulations, using *dietetical* in its original and extensive sense, so as to comprehend under it every particular in the *mode of life.* Thus, attention to cleanliness, by the removal of morbid discharges from the eyes, pure air, early going to rest, quiet sleep, repose of mind, regulated diet, proper exercise, and many similar observances, are in a high degree conducive to recovery; while a neglect of one or more of these rules is often the cause of prolonged and severe attacks of inflammation, in different textures of the eye.

Alcohol, in all its forms, ought, in almost every instance, to be avoided, as likely to increase the heart's action, which is not wanted. The state of the capillaries must be improved in many of the ophthalmiæ by appropriate tonics; but fermented liquors would rarely answer this intention.

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[1] "I have seen cases of ophthalmia where 160 or 170 ounces were said to have been taken (unsuccessfully however) in the space of three days; and I have been told by other practitioners that they have been in the habit of drawing 70 or 80 ounces at one bleeding." Calvert's Reflections on Fever, p. 3; London, 1815.

[2] Medico-Chirurgical Transactions; Vol. xxi. p. 414; London, 1838. London Medical Gazette; Vol. xxiii. pp. 571, 702, 815.

[3] Trattato delle principali Malattie degli Occhi; Vol. i. p. 246; Pavia, 1816.

[4] Julliard, De l'Emploi de l'Excision et de la Cautérisation dans l'Ophthalmie Blennorrhagique; p. 73; Paris, 1835.

[5] Medico-Chirurgical Transactions; Vol. iv. p. 153; London, 1813.

[6] Medical Gazette; Vol. xxxix. p. 1077; London, 1847.

[7] Dobson, Medical and Philosophical Commentaries; Vol. iii. p. 411; Edinburgh, 1784.

[8] Riverius (Opera, p. 263; Francofurti, 1674), quotes with approbation the practice of Zacutus Lusitanus, who cured an ophthalmia in seven days by mercurial inunction, after a year's trial had been made of other remedies without effect.

Cheyne (Natural Method of curing the Diseases of the Body, p. 125; London 1742) states æthiops mineral to be an effectual remedy in inflammation of the eyes.

Warner (Description of the Human Eye, &c., p. 39; London, 1773) recommends mercurials, with opium, in inflammation of the conjunctiva.

Plenck (De Morbis Oculorum, p. 80; Vienna, 1777) recommends the internal use of mercury in gonorrhœal and venereal ophthalmiæ.

Dr. Robert Hamilton published in Duncan's Medical Commentaries (Vol. ix. p. 191; London, 1785) an account of the good effects of calomel and opium in inflammatory diseases. He speaks of the efficacy of mercury in ophthalmia as a fact long established.

Ware (Remarks on the Ophthalmy, &c., pp. 96, 101: 3rd Edition; London, 1793) gave corrosive sublimate successfully in a variety of cases.

By turning to Beer's Bibliotheca Ophtalmica (Vol. i. p. 55, and Vol. ii. p. 85; Vindobonæ, 1799) the reader will find that he was well acquainted, at the time of that publication, both with the effects of iritis and with the power of mercury in preventing effusion of lymph into the pupil He says that blood-letting being premised, there is no remedy so powerful in subduing violent ophthalmia and in preventing suppuration and effusion of lymph as mercury.

Muir (Edinburgh Medical and Surgical Journal; Vol. vii. p. 244 ; 1811) recommended salivation in ophthalmia.

Beer (Lehre von den Augenkrankheiten; Vol. i. pp. 450, 563 ; Wien, 1813) advised calomel with opium in idiopathic iritis; in syphilitic iritis, calomel with opium, or corrosive sublimate.

Dr. Farre (Preface to second edition of Saunders on Some Practical Points relating to the Diseases of the Eye, p. xxxviii. ; London, 1816) stated his belief, that mercurial action by itself might subdue iritis in its acute stage; a doctrine pregnant with danger.

[9] In the first volume of the Medical Observations and Inquiries, published in 1763, Dr. Fothergill and Dr. Fordyce recommended a decoction of powdered cinchona bark as a remedy for scrofulous conjunctivitis. In decoction, and in other forms, there can be no doubt that benefit must have been derived from bark in the hands of succeeding practitioners. At the same time, some authors have spoken unfavourably of this remedy, in the very ophthalmia for which it was praised by Fothergill and Fordyce. " Bark and other tonics," says Mr Lloyd in his Treatise on Scrophula, p 314, " have been especially recommended in this species of ophthalmy; but though I have witnessed their exhibition in numerous cases, I never observed that they exerted the least power over this particular disease."

In ophthalmia neonatorum, Mr. Saunders (1811) advised extract of bark, and Mr. Ryall (1828) sulphate of quina.

In 1828, Mr. Wallace published, in the fourteenth volume of the Medico-Chirurgical Transactions, a favourable account of the effects of cinchona in iritis, after fever.

" Of the value of sulphate of quinine," says Dr. Jacob, " as a remedy in most forms of ophthalmia, when occurring in debilitated or scrofulous subjects, or after long confinement in an unwholesome room, or after the injudicious use of mercury, I am fully aware; and I know of no curative means which merit more the attention of the ophthalmic surgeon." Transactions of King and Queen's College of Physicians ; Vol. v. p 477 ; Dublin, 1828.

In 1828, a child was regularly brought to my house from a distance of seven miles, labouring under obstinate phlyctenular conjunctivitis, for which I tried many remedies without avail. One day, when the child was brought in, some sulphate of quina was lying on the table, and it struck me it was worthy of a trial in so obstinate a disease. It cured the child in a few days. Other cases of the same disease yielded in the same favourable manner. I introduced the remedy at the Glasgow Eye Infirmary, extending its use to scrofulous corneitis and ophthalmia tarsi, and in November, 1828, published some account of its beneficial effects in those diseases, in the Glasgow Medical Journal.

[10] Medical Gazette ; Vol. xii. p. 18 ; London, 1833.

[11] Noble's Treatise on Ophthalmy ; p. 209 ; Birmingham, 1801. Vetch, in Medico-Chirurgical Transactions ; Vol. xvi. p. 357 ; London, 1830.

[12] Though the effect of certain vegetable substances in dilating the pupil was known to the ancients, and, as Pliny informs us in the 13th chapter of the 25th book of his Natural History, advantage taken of it in operating on the eye, the application of such substances for the purpose of combating the contraction of the pupil which is apt to occur in iritis, appears altogether modern. Indeed, I am not aware that Darwin (Zoonomia ; Vol. iii. p. 132 ; London, 1801) was preceded in the suggestion, that the power of belladonna in dilating the pupil might be of advantage in some ophthalmiæ.

On the medical history of belladonna and other mydriatics, see Pulteney, Philosophical Transactions; Vol. i. part i. p. 62; London, 1758. Himly, Krankheiten und Missbildungen des menschlichen Auges; Vol. i. p. 18 ; Berlin, 1843.

It would be important to know what plants possess the power of dilating the pupil. Anisodus luridus, a native of Nepal, is said to do so. Baratta (Osservazioni Pratiche sulle Malattie degli Occhi; Tomo i. p. 139 ; Milano, 1818) tried conium maculatum, aconitum neomontanum, digitalis purpurea, rhus radicans, crocus sativus, arnica montana, and papaver somniferum; but none of them dilated the pupil.

[13] Barratta, loc. cit. : Ammon's Zeitschrift für die Ophthalmologie ; Vol. i. p. 417 ; Dresden, 1831. : Dupuytren, Leçons Orales de Clinique Chirurgicale, Tome iv. p. 129 ; Paris, 1834.

[14] Transactions of the Association of Fellows and Licentiates of the King and Queen's College of Physicians in Ireland ; Vol. iv. p. 257 ; Dublin, 1824.

[15] Review of the different Operations performed on the Eyes, p 60 ; London, 1826.

[16] London Medical and Physical Journal for September, 1828.

[17] London Medical and Surgical Journal for October, 1831, p. 325.

[18] Walker, Lancet for 1830-1 ; Vol. ii. p. 619. Julliard, Op. cit. p. 73.

[19] Annales d'Oculistique ; Tome xxiv. p. 118 ; Bruxelles, 1850. London Journal of Medicine ; Vol. vi. p. 268.

[20] Ware, Remarks on the Ophthalmy, &c., p. 46 ; London, 1795.

SECTION III.—OBJECTIVE AND SUBJECTIVE SYMPTOMS OF THE OPHTHALMIÆ.

A tolerably correct notion may in general be formed of the kind of ophthalmia which is present, either, in the *first* place, by looking at the inflamed eye, and particularly by observing the arrangement of the enlarged blood-vessels, without hearing the patient's account of his sensations; or, in the *second* place, by learning from the patient the kind of pain with which he is affected, without looking at the eye. Of course, before proceeding to treat any particular case, we avail ourselves of all the symptoms, *anatomical* and *physiological;* both what are offered to the direct examination of our own senses, and what we must receive on the testimony of the patient.

§ 1. *Arrangements of the Blood-vessels.*

We meet with four arrangements of the external vessels, in the ophthalmiæ; namely, the *reticular*, the *zonular*, the *fascicular*, and the *varicose.*

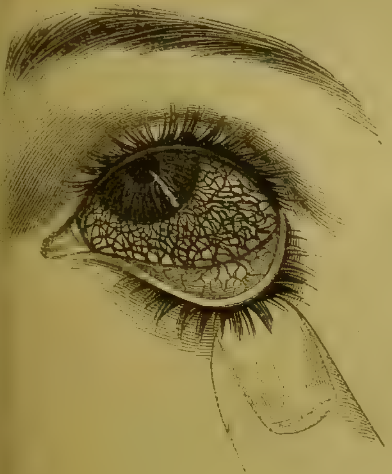

Fig. 49.

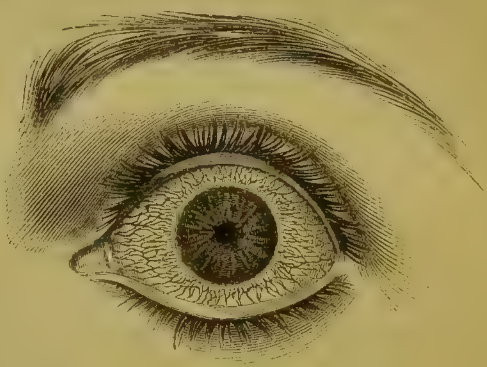

Fig. 50.

1. The network observed in the first of these arrangements, (*Fig.* 49.) is seated in the conjunctiva; the vessels by which it is formed are comparatively large, and tortuous; they anastomose freely with one another, and can be shoved or drawn aside, by pressing or dragging the eyelids with the finger. This arrangement resides in the superficial conjunctival network, derived from the lacrymal and palpebral branches of the ophthalmic artery, and is characteristic of puro-mucous conjunctivitis.

2. In zonular inflammation, (*Fig.* 50.) the vessels are small and hair-like; they are never very tortuous, but run like radii towards the cornea, thus forming not a network, but a halo, over which the conjunctiva is easily made to slide. This arrangement resides in the deep-seated conjunctival or sclerotic network, formed from the oculo-muscular and anterior ciliary branches of the ophthalmic artery, and is symptomatic of sclerotitis and iritis.

3. In the preceding arrangements, the enlarged vessels are spread

pretty equally over the eyeball; but in the fascicular (*Fig.* 51.), the redness commonly occupies only one side of the eye, and often consists of a few vessels only, running towards the cornea, and terminating in a phlyctenula or aphtha. This arrangement, then, belongs to the eruptive varieties of conjunctivitis.

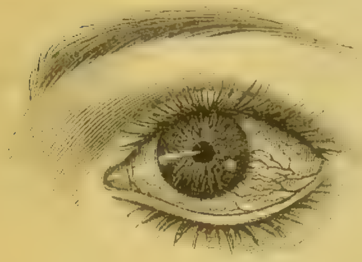

Fig. 51.

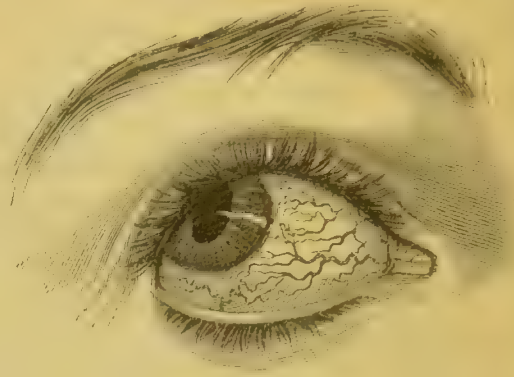

Fig. 52.

4. Large tortuous vessels, derived from those belonging to the recti muscles constitute the varicose arrangement (*Fig.* 52.), which we meet with most frequently in the chronic stage of arthritic and some other internal ophthalmiæ. The vessels in question are branches of one or other of the seven trunks, which, advancing towards the cornea, are visible in every eye; namely, one from the rectus externus, and two from each of the other recti.

These four arrangements of vessels are, in general, perfectly distinct; but, in some cases, they are combined. They may be obscured by what is termed *chemosis;* an inflammatory œdema of the areolar tissue under the conjunctiva, so that this membrane is raised from the sclerotica, and so much swollen as sometimes to overlap the edge of the cornea, or even protrude from between the eyelids. When chemosis is present, nothing can be seen of the particular distribution of the vessels. In the compound ophthalmiæ, again, such as the catarrho-rheumatic, &c., two or more of the arrangements may be combined.

In the acute stage of any of the ophthalmiæ, the blood distends the arteries chiefly, and hence the vessels appear of a bright red. In the chronic stage, the veins become dilated, and show a livid hue.

§ 2. *Kinds of Pain.*

Two different varieties of pain attend the ophthalmiæ; the one characteristic of the inflammations of the conjunctiva, the other of those affecting the sclerotica and iris. The former is uniformly compared by the patient to the feeling of sand in the eyes; it is experienced chiefly during the day, and especially when the patient tries to use the eyes; the latter is pulsatory, affects the circumorbital region as much as the eye itself, and is strikingly nocturnal, commencing after sunset, increasing in violence till after midnight, and abating towards sunrise, being scarcely felt during the day, but returning about the same hour in the evening. The external, gritty, diurnal pain arises from pressure on the nerves of the conjunctiva and eyelids; the internal, pulsatory, nocturnal pain depends on pressure on the ciliary nerves, but is often referred, not so much to the eye, as to the branches of the fifth nerve, radiating from the orbit, especially the supra-orbitary branch. Ophthalmiæ attended by the conjunctival or sandy pain only, are generally curable by external applications; those accompanied by the circumorbital or pulsatory pain, always require venesection. Pure retinitis is without pain, and is therefore a deceptive disease.

SECTION IV.—SIMPLE OR PHLEGMONOUS CONJUNCTIVITIS.

Syn. — Taraxis. Ophthalmia angularis. Conjunctivite franche, *Rognetta.*

Fig. Dalrymple, Pl. XIII. *fig.* 1.

By simple or phlegmonous conjunctivitis is to be chiefly understood an *idiopathic* inflammation of the conjunctiva, in which there is manifested neither puro-mucous discharge, nor the appearance of any cutaneous eruption. The elaborate descriptions of Slade[1], Rognetta[2], and Desmarres[3], would lead us to suppose, that such a disease was a common and rather severe one; whereas it is neither. Cases occasionally occur, in which a portion of the ocular conjunctiva, rarely more than that covering the nasal or temporal side of the eyeball, becomes injected and slightly swollen. The inflamed portion of the membrane generally presents a triangular form, but is easily distinguished from a pterygium. Such cases I have been in the habit of designating by the name *taraxis,* the ancient term for the slightest degree of ophthalmia. This affection sometimes occurs, as a red patch, on the corresponding side of each eyeball.

A dose of purgative medicine, and a mild astringent wash, have generally sufficed to dissipate this inflammation. Rarely has it been necessary to apply two or three leeches over the nasal vein.

Symptomatic inflammation of the conjunctiva may be simple or phlegmonous; such as that which attends subconjunctival phlegmon, already described (see p. 242); and that which occurs in attendance on inflammation of other textures of the eye, as on sclerotitis or corneitis.

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[1] Ophthalmia. By J. Slade, M.D., p. 23; London, 1838.

[2] Traité philosophique et clinique d'Ophthalmologie, p. 275; Paris, 1844.

[3] Traité théorique et pratique des Maladies des Yeux, p. 167; Paris, 1847.

SECTION V. — PURO-MUCOUS CONJUNCTIVITIS IN GENERAL.

Syn. — Lippitudo, *Celsus.* Ophthalmoblenorrhœa.

The muco-cutaneous membrane which lines the eyelids and invests the anterior surface of the eyeball, is apt to suffer either from inflammation, like that by which the other parts of the mucous system are commonly attacked, namely, a puro-mucous, blenorrhœal, or catarrhal inflammation; or to be affected with diseases evidently partaking of the nature of cutaneous eruptions. The conjunctiva thus resembles the membrane of the fauces, which sometimes is affected with catarrhal, and at other times with aphthous inflammation; or the continuation of the lining membrane of the urethra over the glans penis, and inside the prepuce, which in one case we see affected with a species of gonorrhœa, and in another with pustular or herpetic eruptions.

Symptoms.—There are certain symptoms characteristic of the genus *conjunctivitis puro-mucosa*, whether it arise from the influence of cold, or from contagion, and whether the contagion be derived from the eye of another person, or depend upon the application of puriform matter from other quarters, as that of leucorrhœa or gonorrhœa. All these causes are capable of exciting puro-mucous conjunctivitis; contagion of any sort always producing a much more severe disease than the mere influence of cold. The symptoms of puro-mucous conjunctivitis are analogous to those which attend the blenorrhœal or purulent inflammations of other mucous membranes, as of the Schneiderian membrane in catarrh, or the lining of the urethra in gonorrhœa. The most striking character of this genus is, no doubt, the puriform discharge. I need scarcely say that the pus is secreted by the conjunctiva; it is merely an increased and changed discharge of mucus, and not the effect of ulceration.

Puro-mucous ophthalmia, from whatever cause it originates, commences in the conjunctiva and is at first confined to that tunic; but in severe cases, the other textures, and especially the cornea, are apt to suffer, and thus the eye may be destroyed.

Stages.—Puro-mucous conjunctivitis presents four stages. The *first*, which is generally so short as to pass unobserved, is the stage of pure inflammation. The *second* is marked by discharge, more or less puriform, and is often attended by chemosis, and swelling of the eyelids. In the *third*, the cornea is affected, becoming opaque, infiltrated first with serum, then with pus, softened, and more or less deeply ulcerated, so that the front of the eye is apt to give way, the iris to protrude, and the case to end in staphyloma. The *fourth* stage is characterised chiefly by the papillary structure of the palpebral conjunctiva remaining hypertrophied, and presenting a granular or sarcomatous appearance, while the lids, in this state, rubbing on the cornea, render this part of the eye vascular and nebulous.

During the course of puro-mucous inflammation of the conjunctiva, the membrane is often enormously dilated, all its folds becoming amplified, so that instead of being hid between the eyelids and eyeball, they actually protrude externally. Its secreting surface is also greatly changed by abnormal nutrition; so that its papillæ, which in the natural state are small and sessile, become distinctly visible to the naked eye, and project from the inside of the lids like so many granulations. There is not much new production in all this, but chiefly an inflammatory amplification of natural structure.

The destruction of the cornea in the puro-mucous ophthalmiæ is to be attributed, not altogether to a vital, but partly to a mechanical cause; not altogether to excessive inflammatory action in the cornea itself, but partly to the pressure caused by the enormously distended conjunctiva of the eyelids and eyeball. Other causes, n doubt, concur, in the puro-mucous inflammations of the conjunctiva, to produce opacities of the cornea, detachment of its epithelium, and ulceration; and, in particular, its maceration in a flood of purulent fluid, not sedulously removed by lotions and injections. But the destruction of the cornea by infiltration of serum and pus, by ramollissement and ulceration, may be referred in no small degree to the pressure of the chemosed conjunctiva, interfering mechanically with the due nutrition of the part. A circular groove of ulceration on the edge of the cornea, at the place covered by the chemosed conjunctiva, is a frequent occurrence, and seems attributable to excessive absorption excited directly by pressure, although it must be noticed that troughing ulcers, as they have been termed, occur also where there is no chemosis. Destruction of the cornea is much more apt to happen in those subjects, in whom the lids, from original conformation, sit close upon the eyeball, the sinuses of the conjunctiva being small and the fissura palpebrarum short, than in those in whom we find the opposite conditions. I have remarked this especially in infants.

With respect to the discharge from the conjunctiva in the puro-mucous ophthalmiæ, it may be well to recollect, that "mucus, as a copious fluid secretion, has," as Mr. Simon states, "no existence in health; the only natural secretion of a mucous membrane is its epithelium, which ought not to exist in quantity sufficient for any evident discharge. If the secretion be hurried, it immediately begins to assume the forms and physical characters of pus."[1] The discharge of puriform fluid from the inflamed conjunctiva goes on without any breach of surface, and the fluid discharged possesses in itself no acrid or erosive property. Pent up, however, between the lids and the eyeball, it irritates greatly the inflamed organ, and the allowing of it to remain there increases in a high degree the risk of disorganisation of the cornea. The discharge irritates mechanically; it produces the feeling of a foreign body in the eye, which feeling is removed when the discharge is cleaned away. This mechanical irritation excites more inflammation; but besides this, if the discharge is of a specific kind, as gonorrhœal, its presence inoculates one portion of the conjunctiva after another.

The granular stage of the puro-mucous ophthalmiæ is of indefinite duration. Worn out by long-continued suffering, the patient is apt to become hectical, and, when this is the case, the eyes prove incurable.

Pathological anatomy.—The following account of the pathological anatomy of the ophthalmia neonatorum, by M. Dequevauviller, may be considered applicable to the puro-mucous inflammations of the conjunctiva generally:—

1. The appearances of inflammation are dissipated by death; the red colour of the conjunctiva has given place to a livid tint, the turgescence has sunk away, and the membrane is loose and wrinkled.

2. The nebulous state of the cornea has subsided.

3. The lamellæ of the cornea are separated from one another by thin fluid, and are less adherent than in the normal state.

4. In the state of ramollissement, the lamellæ are reduced by the slightest scraping to the state of a thick, yellowish-white liquid, similar to what is seen when the scalpel is drawn along a softened fibrous membrane.

5. When the cornea has been deeply ulcerated, the surface of the ulcer appears,

when viewed through a lens, smooth; but after two or three hours' maceration in water or alcohol, a thin pellicle may be removed from the surface of the ulcer. It is then easy to separate the lamellæ with the point of the scalpel, and to perceive in each of them an opening, as if formed by an *emporte-pièce*, of which the diameter is more considerable in proportion as the lamina, which is perforated, is the more superficial. The lamina forming the bottom of the ulcer is slightly opaque, but those beneath it may be transparent.

6. If there is procidentia iridis, it is the free edge of the membrane, which has fallen into the ulcer. The larger the opening, the more considerable the portion of prolapsed iris. When only a small part is prolapsed, the pupil assumes the form of an irregular ellipse, one end of which corresponds to the opening in the cornea. If the portion is great, the pupil disappears completely. In this case, sometimes the opposite ciliary edge is detached and drawn towards the ulcer. Whatever be the colour of the iris, the hernia always presents a uniform black hue. Adhesions are generally found between the iris and the membrane which covers in the ulcer.

7. If the cornea be extensively destroyed, neither the lens nor the greater part of the vitreous body is to be found. If the case is recent, the iris is glued to the debris of the cornea, and the pupil widely open. If not recent, the eye is shrunk to the bottom of the orbit, solid, and the different elements of its structure scarcely recognisable.[2]

Cure.—A treatment, partly antiphlogistic and soothing, partly stimulating and smarting, is the most successful in the cure of all the puro-mucous ophthalmiæ.

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[1] General Pathology, by John Simon, p. 112; London, 1850.

[2] Archives générales de Médecine, 4e Série, Tome ii., p. 9; Paris, 1843.

SECTION VI. — CATARRHAL OPHTHALMIA.

Syn. — Catarrhus oculi, *Langenbeck.* Ophthalmia purulenta mitior. Conjunctivitis puro-mucosa catarrhalis.

Fig. Wardrop, Pl. I. *fig.* 1. Dalrymple, Pl. I. *fig.* 1. Pl. VII. *fig.* 6. Sichel, Pl. II. *figs.* 1, 2.

There are three ophthalmiæ, which are frequently excited, especially in adults, by atmospheric influences; namely, the *catarrhal*, the *rheumatic*, and the *catarrho-rheumatic.* The first of these is a puro-mucous or blenorrhœal inflammation of the conjunctiva; the second, an affection of the fibrous sclerotica; while in the third, both the conjunctiva and sclerotica are attacked, the symptoms of catarrhal being united to those of rheumatic ophthalmia.

Symptoms.—The inflammation in the catarrhal ophthalmia, which is by far the most common disease of the eye in adults, is almost entirely confined to the conjunctiva and Meibomian follicles. The symptoms are redness and swelling of the internal surface of the eyelids, reticular redness of the sclerotic conjunctiva, sandy pain, and adhesion of the eyelids in the morning.

1. The conjunctival secretion is increased in quantity, and occasionally becomes opaque, thick, and puriform; but in many cases remains transparent, its superabundant quantity giving to the eye an appearance of more than usual moistness, and communicating to the patient a feeling of glueyness; while the Meibomian secretion, also increased in quantity and changed by disease, concretes on the edges of the lids and amongst the eyelashes, and binds them together during the night.

2. In mild cases, the redness is chiefly in the conjunctiva lining the eyelids. On the white of the eye, the vessels are arranged in a network (*Fig.* 49.); and can be moved in every direction, by pressing the eyelid against the eyeball with the finger, showing that they reside in the conjunctiva. Not unfrequently we observe spots of extravasated blood beneath the conjunctiva, or even a pretty general but slight ecchymosis. In severe cases, chemosis takes place, even to a great extent; so much so, that if only general treatment be employed, as blood-letting and purging, while local means are neglected, the cornea may assume a nebulous appearance from being infiltrated with serum, ulcerate at its edge, become the seat of abscess, burst, and be more or less extensively disorganised.

3. In catarrhal ophthalmia, the patient uniformly complains of a feeling of pricking or roughness of the eye, or as if sand, hot ashes, or broken glass was under the upper eyelid; a sensation which never attends the pure rheumatic ophthalmia, and may therefore be regarded as strikingly diagnostic. So distressing, even at the beginning of an attack of catarrhal ophthalmia, is the sensation as if sand or some other foreign body were under the upper eyelid, that I have repeatedly been requested to visit patients, in whom this disease was commencing, who supposed that some particle of dust had actually got into that situation; and in one instance I was called in the night to visit a medical gentleman, who was so convinced, from the feelings which he experienced, that this was the case, that he had made various attempts, with his dressing probe, to free himself from the imaginary offending substance. The chief cause of the sandy pain is the rubbing of the very sensitive eyelids over the turgid vessels of the sclerotic conjunctiva. The presence of flakes of puriform mucus also excites this feeling.

The exacerbation in catarrhal ophthalmia is in the evening, and is attended with itchiness of the eyes and photophobia, but is relieved by going to bed, and the patient sleeps, in general, without interruption during the night. The pain is renewed when the patient attempts to use the eyes in the morning, owing to the motion of the inflamed surfaces. In the catarrhal ophthalmia, the patient is generally free from headache; whereas in the rheumatic, one of the most remarkable symptoms is supra-orbital or circum-orbital pain, severely aggravated during the night, the exacerbation in this disease being from 6 P.M. till 6 A.M. When headache does attend catarrhal ophthalmia, it is seated across the forehead, as if in the frontal sinuses, and is felt most in the morning.

4. Catarrhal ophthalmia is often attended by symptoms of inflammation of the lining membrane of the nostrils, fauces, and trachea. In the other cases, the affection being confined to the eye, is an uncomplicated mucous conjunctivitis. In female children of two or three years old, catarrhal ophthalmia is not unfrequently present along with a puro-mucous discharge from the vagina. In such cases, the ophthalmia is sometimes mild, but often pretty severe, and the discharge distinctly purulent.

Causes.—Atmospheric changes, and especially exposure to cold and wet, are the chief exciting causes of catarrhal ophthalmia. Night-watching, and exposure to the night-air, after being much heated, or in a state of intoxication, frequently give rise to the disease. Sailors, soldiers on board transports, and others on board ship, are often attacked by it, especially those who sleep near a port-hole, or open hatchway; also soldiers in hospital, especially those who sleep near the door, a window, or any aperture admitting a draught of air. The nightmen of Paris are subject to this disease, which they term *la mitte.*[1] Wet feet is a cause which some of my patients have particularly mentioned. A delicate female was violently attacked with this disease in both eyes, in consequence of riding outside a stage-coach from Edinburgh to Glasgow. Another lady owed her first attack to bathing in the sea; and for many months was liable to a relapse on any slight exposure, or over-exercise of the sight. Reading or writing to a late hour in the night, sometimes brings on catarrhal ophthalmia, or what we should rather call simple mucous conjunctivitis, the discharge being scarcely puriform. If those who have become long-sighted from age, read or write without glasses, this disease is apt to be the result. Prolonged suckling sometimes brings on puro-mucous conjunctivitis, attended with more than common irritation of the eyes. The affection called *hay-fever* is apt to be attended by considerable inflammation of the conjunctiva, of catarrhal character. An individual who has once laboured under catarrhal ophthalmia, is more likely to be attacked again; one of my patients had three attacks between May and January.

Epidemic.—In many instances, catarrhal ophthalmia has been known suddenly to attack about the same time a great number of persons, who happened to be exposed to the same general exciting causes. Assalini, for example, relates, that in May, 1792, several battalions of the Duke of Modena's troops arrived at Reggio to quell some riots. These troops passed the first night after their arrival under the spacious porticoes of a convent looking to the north, in the lowest part of the town, and near the trenches of the citadel. Many of the soldiers contracted a violent catarrhal ophthalmia, which was attributed to the dust of the straw on which they had slept, and not to the moist and cold air of the place, which no doubt was the true cause, and which was so much the more likely to prove hurtful, as these men had been accustomed to close and comfortable quarters.[2]

Catarrhal ophthalmia has been known to spread itself still more extensively, attacking a great proportion of the inhabitants of a town or district, so as to obtain the name of *epidemic ophthalmia.* In 1778, it attacked the whole neighbourhood about Newbury, in Berkshire; and, in the same year, it prevailed in several of the English camps, where it was known by the name of the *ocular disease.* In the winter of 1803, a catarrhal ophthalmia prevailed almost generally in Paris, and received from the people the name of *cocote.*[3] The same occurred in 1806, and was, in many instances, attended by an affection of the mucous membrane of the air-passages; a complication which I have repeatedly observed in the sporadic cases of this country. The same complaint prevailed in 1808, at Vicenza, in Italy. It has been mentioned by some authors, that this disease is more common in summer and autumn. In Glasgow and its neighbourhood, it is common at all seasons; but most abundant during cold wet weather, or when the east or north-east wind prevails.

The whole way from Orihuela to Alicant, in Spain, Mr. Inglis observed that almost all the children, and very many grown-up persons, were affected with sore eyes. The people in the neighbourhood were unable to assign any cause for this, though he was informed at Alicant that it was to be attributed to irrigation.[4]

In Egypt, many circumstances favour the rise and continuance of puro-mucous ophthalmia; such as her low plains, sandy deserts, the lakes, as in the neighbourhood of Alexandria, and the dazzling glare reflected from the uniformly white surface which every object presents. On European armies in that country, the high temperature, and the heavy night-dews, must have operated unfavourably, as well as the minute particles of hot sand which float in the air, and are raised by the slightest breeze. Although endemic, or epidemic, and, in the first instance, excited by atmospheric and other general causes, it appears afterwards to become contagious, and, then in an aggravated form constitutes the Egyptian or contagious ophthalmia.

Prognosis.—If catarrhal ophthalmia be neglected, or treated only with general remedies, or with improper local ones, it will continue for many weeks, and become the cause of much febrile excitement and constitutional illness, as well as local distress and danger. Amongst other bad effects of neglect, the conjunctiva, particularly where it lines the upper eyelid, becomes sarcomatous and rough, and by rubbing in this state against the cornea, renders it, and especially the upper half of it, vascular and nebulous, or even densely opaque. The discharge from the conjunctiva is apt, also, under neglect or improper treatment, to become thicker and more opaque, and to show a power of propagating the disease by contact.

Contagiousness.—I regard it as scarcely admitting of doubt, that the discharge in catarrhal ophthalmia, if conveyed from the eyes of the patient to those of others, by the fingers, or by the use of towels and the like in common, is apt to excite a conjunctivitis still more severe, more distinctly puriform, and more dangerous in its effects on the cornea, than was the original ophthalmia. This is the conclusion to which I have arrived, from the observation of many instances, in which, as far as it was possible to come to the facts, this disease having arisen in one member of a family from atmospheric exposure, several others of the family have become affected without any such exposure that could be ascertained; and while, in the first affected. the disease was comparatively mild, and scarcely puriform, in the latter the symptoms were more violent, and the discharge thick, abundant, and opaque.

I think it probable, that the ophthalmia which attacked the British and French armies in Egypt was a puro-mucous conjunctivitis excited by atmospheric causes, but that it afterwards degenerated into a contagious, perhaps infectious, disease; that is to say, that it was propagated by actual contact of the discharge, and perhaps by miasmata from the eyes floating through the air. Nor is this idea inconsistent with what is generally admitted regarding contagious and infectious diseases. If we admit such a thing as contagion or infection at all, we must also admit, I should apprehend, that diseases originally excited by external influences, are propagated only in the second and succeeding instances by their contagious or infectious power.

I know of no experiments in which the discharge from an eye affected with simple catarrhal ophthalmia, or puro-mucous conjunctivitis arising from atmospheric influence, has been applied to a sound eye. Dr. Guillié's experiments, indeed, may have been performed with matter of this description. He took the puriform mucus from the eyelids of some children affected with puro-mucous conjunctivitis, in the Hospital for Sick Children at Paris, and introduced it under the eyelids of four children belonging to the Institution for the Blind. These children were amaurotic, but the external surface of their eyes was healthy and entire. In all four a regular puro-mucous conjunctivitis was produced.[5] Mr. Mackesy relates[6] some experiments, in which he applied the discharge, taken from the eyes of four soldiers, to his own, without producing any inflammation. The men from whom the matter was taken appear to have been labouring under catarrhal ophthalmia, but the application to the conjunctiva was probably insufficiently accomplished, Mr. Mackesy satisfying himself principally with keeping a piece of linen, imbued with the discharge, laid upon his eyelids.

In the next section, I shall have occasion to refer to one or more striking instances of catarrhal ophthalmia spreading apparently by contagion or infection.

Treatment.—Catarrhal ophthalmia yields readily to a very simple treatment, chiefly of a local stimulating kind. I was first struck with the truth of this fact in the successful management of this disease by Professor Beer, at Vienna, in 1817; and I was confirmed in this view by an attentive consideration of the cases detailed in an excellent Report by Mr. Melin, published in the London Medical and Physical Journal, for September, 1824. The results of my own practice, both in private and at the Glasgow Eye Infirmary, some account of which I submitted[7] to the profession in 1826, have amply borne me out in the belief, that general remedies in this disease are inferior in importance to local ones; that violent general remedies are worse than useless; and that a local stimulant treatment may generally be relied on.

1. The feeling of sand in the eye is uniformly relieved, and the inflammation abated, by the use of a solution of nitrate of silver, a remedy of sovereign utility in the puro-mucous inflammations of the conjunctiva, and without which these diseases would often prove destructive to vision. The solution which I generally employ contains 4 grains of the nitrate in 1 ounce of distilled water. A large drop is to be applied to the eye once, twice, or thrice a-day, according to circumstances, by means of a pretty thick camel-hair pencil. For a minute or two after the drop is applied, nothing particular is felt. The eye then begins to be affected with pricking pain, which,

when the inflammation is acute, becomes pretty smart, continues for perhaps 10 minutes, and dies away; after which the eye feels much easier than it did before the drop was applied. In particular, the feeling of sand and tendency to lacrymation are much relieved. The eye continues easy for perhaps five or six hours, when the symptoms again return, and ought immediately to be checked by the application of another drop. As the disease subsides, the remedy gives less and less pain, till at last it is scarcely felt. I have sometimes alarmed other practitioners, by proposing to drop upon the surface of an eye highly vascular, affected with a feeling as if broken pieces of glass were rolling under the eyelids, and evidently secreting puriform matter, a solution of lunar caustic; and I have been not a little pleased and amused at their surprise, when, next day, they have found all the symptoms much abated by the use of this application. If the patient is of a torpid constitution, and the discharge from the conjunctiva copious, a solution of 10 grains to the ounce may be used. Stronger solutions than this, or even a saturated one, may sometimes be applied with advantage.

2. The patient experiences much relief from fomenting the eyes with warm water, or warm poppy decoction. As a fomentation or collyrium, I am in the habit, however, of employing a solution of 1 grain of corrosive sublimate, and 6 grains of muriate of ammonia, in 6 ounces of water, to a tablespoonful of which, at the time of being used, is to be added an equal quantity of boiling water. This diluted solution is to be used thrice a-day for fomenting the eyelids, by means of a folded piece of linen, or flat soft sponge. In mild cases, a few drops are then allowed to flow in upon the eye; but, in severe cases, in which the discharge is copious and puriform, the collyrium must be injected over the whole surface of the conjunctiva, and especially into the upper fold of that membrane, by means of a syringe, so that the morbid secretion may be entirely removed, and the diseased membrane touched immediately by the solution. Great relief is obtained in all the puro-mucous ophthalmiæ by the removal of the discharge, the feeling of sand in the eye being in a great measure caused by its presence.

3. At bedtime, about the size of a barley-corn of red precipitate ointment, melted on the end of the finger, is to be smeared along the edges of the eyelids. The ointment must be prepared in the manner specified at page 146, and ought generally to be of the strength of 20 grains to the ounce.

4. I rarely find it necessary to take away blood in catarrhal ophthalmia, either from a vein or by leeches. When there is more than ordinary constitutional irritation, the taking away of from 12 to 20 ounces of blood from the arm, will no doubt prove useful; but this will rarely be necessary if the disease has not been neglected for a number of days or mistreated. If the local symptoms do not speedily yield to the remedies already mentioned, from 6 to 12 leeches may be applied, two or three over the nasal vein, and the rest over the temple or eyelids.

5. Scarification of the conjunctiva of the eyelids is necessary only in cases in which there is some degree of chemosis, and a distinctly

puriform discharge. In such cases, it proves a valuable means of cure, if performed according to the directions given at page 424.

6. A brisk dose of calomel and jalap may be ordered at the commencement, with occasional doses of neutral salts during the course of the disease.

7. Determining to the skin is useful. This may be done by the warm pediluvium at bedtime, small doses of spiritus Mindereri, or of any other mild diaphoretic, in combination with diluent drinks, and rest in bed.

8. In severe cases, a blister to the back of the neck will be found useful, or blisters behind the ears, kept open.

9. When the disease has been long neglected, and has fallen into a chronic state, the remedies already indicated should be tried in the first instance. Should they fail in producing the amount of benefit which is expected, advantage will be obtained by adding two drachms of vinum opii to the 6 ounces of the collyrium. Recourse may also be had to a nitrate of silver salve, containing from 10 to 20 grains of the salt to the ounce of fatty matter, or to red precipitate salve of the strength of from 30 to 60 grains to the ounce. The method of using these salves is to wipe the conjunctiva of both lids dry, and then having about the bulk of a split pea of the salve, melted on the point of the finger, rub it into the diseased surface. The salve is a substitute for the nitrate of silver solution, and is to be applied once a-day.

10. Though the sclerotic conjunctiva has become free from redness, it is not to be supposed that the disease is completely subdued. It is probable that the palpebral conjunctiva still remains in an injected state. The inside of the eyelids, and especially of the upper one, ought daily to be inspected. If there is any tendency to a rough and sarcomatous state of the conjunctiva, it ought to be alternately scarified, and touched with solid sulphate of copper or nitrate of silver, as I shall explain more particularly under the head of *Granular Conjunctiva.*

Regimen.—The patient should use a mild diet, without fermented liquors, avoid reading and writing, shade the eyes from bright light, and go early to bed.

I have treated many hundred cases of catarrhal ophthalmia according to the plan above detailed, and generally with these three applications only; namely, the solution of nitrate of silver, the bichloride of mercury collyrium, and the red precipitate salve. In almost no case, (indeed, I may say in no case where scrofula did not modify the symptoms,) in which these remedies were had recourse to previously to ulcer or opacity of the cornea, did any ulcer or opacity ever occur; nor did the symptoms ever fail speedily to subside. On the other hand, I have repeatedly had occasion to see cases of this disease which had been much aggravated by trusting altogether to general treatment, and especially to bleeding; or by the use of acetate of lead, or sulphate of zinc, as local applications.

Modified by scrofula.—Catarrhal ophthalmia occurring in scrofulous habits, and especially in children of that constitution, is very liable to degenerate into the phlyctenular ophthalmia, hereafter to be described.

The scrofulo-catarrhal is one of the compound ophthalmiæ, which are apt to prove puzzling to the inexperienced practitioner. The treatment, in cases of this sort, must partake of the remedies above mentioned, and of those hereafter to be recommended for scrofulous conjunctivitis.

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[1] Velpeau, Manuel pratique des Maladies des Yeux, p. 180; Paris, 1840.

[2] Manuale di Chirurgia; Parte ii., p. 117; Milano, 1812.

[3] Reveillé-Parise, Hygiène Oculaire, p. 19; Paris, 1823.

[4] Spain, by Henry D. Inglis; Vol. ii., p. 223; London, 1837.

[5] Bibliothèque Ophtalmologique; Tome i., p. 81; Paris, 1820.

[6] Edinburgh Medical and Surgical Journal; Vol. xii., p. 411; Edinburgh, 1816.

[7] Medical and Physical Journal; Vol. lvi., p. 327; London, 1826.

SECTION VII.—CONTAGIOUS OPHTHALMIA.

Syn.—Conjunctivitis puro-mucosa contagiosa. Epidemic ophthalmia. Ophthalmia purulenta gravior. Ophthalmia bellica. Egyptian ophthalmia. Purulent ophthalmia. Conjonctivite granuleuse. Ophthalmie militaire.

Fig. Gräfe, Tab. I.—IV. Müller, Taf. I. II. Eble, Taf. III. Dalrymple, Pl. IX. *fig.* 3, Pl. X. and XI.

The disease now to be considered is essentially the same with that described in the last section, only much more severe, and although excited in the first instance in a similar way—namely, by exposure to atmospheric influences—propagated in the second and succeeding cases by contact, and perhaps by a volatile matter arising from the diseased eyes, and floating through the air. It is a common and most afflictive disease in warm climates, as Egypt, Persia, and India. Having passed, along with the British troops, to this country, in 1800, 1801, and 1802, from Egypt, where for ages it has been endemic, it is commonly known by the name of the *Egyptian ophthalmia.* Rarely seen in private life, it is mostly met with in armies, on board ship, in poor-houses, or in large public schools. It may arise in any climate or region of the earth, and is not the effect of any specific principle or virus imported from Egypt.

Symptoms.—These succeed each other with different degrees of rapidity, and present very different degrees of severity in different individuals who are suffering at the same time, in the same place, and from the same infection. These differences depend on the constitution of the patients, on their state of health when they become affected, and upon incidental and minute circumstances of situation. In women, for instance, the disease is said to be milder than in men. It has also been remarked, that as the age is near to puberty, on either side, the disease is in general more fatal in its effects. In scrofulous persons, it is always tedious, and more likely to destroy the cornea.

The disease is also much more severe in one instance of its occurrence than in another. In 1806, it raged with greater rapidity and severity in the 54th than in the 52nd regiment. It never was so severe in the Military Asylum at Chelsea, as in the latter regiment. It appears to have been much more severe in the Military Asylum in 1809 than in 1804. These differences appear to be owing to the climate and situation where the disease occurs, the temperature, the season of the year, and other general causes.

The purely inflammatory stage of this disease, though often shorter in its duration, appears never to surpass 30 hours. At the end of that time, purulent matter is always formed by some portion of the conjunctiva. In most cases, the purely inflammatory stage is so slight and rapid, as not to come under the observation of the surgeon. So early does the formation of purulent matter take place, that even when the inflammation has extended no farther than the palpebral conjunctiva, pus is seen on everting the eyelids, although its quantity is not yet sufficient to be observed unless this mode of examination be adopted.

The disease appears to commence soon after the application of the contagious or infectious matter to the conjunctiva, but in many cases it advances to the secretion of purulent matter, before the patient is aware that he is affected. It often happens that he makes no complaint till his attention is excited by finding his eyelids adhering in the morning, or till the feeling as if some extraneous body were in the eye has become distressing. A sudden attack of darting pain through the eyeball or in the forehead, is sometimes the first thing which attracts his attention, while in other cases, the disease advances till there is such vascularity of the conjunctiva as cannot fail to be observed by others. In all these cases, the disease has unquestionably existed for some time, but it has been unobserved by the patient himself, or if observed, concealed. When this disease breaks out in a family, or in any larger community of individuals, those first attacked, ignorant of the previous existence of the disease in others from whom they might have received it, and ignorant of its nature, will seldom demand advice till urged by the violence of the symptoms. When once the plan is adopted, as it should always be, of daily inspecting the *healthy* individuals of any community in which the disease is likely to appear, it will be the fault of the surgeon if he ever meets with a new case in which the disease is so far advanced as to be attended with any other symptom than an increased vascularity of the conjunctiva of the eyelids.

The right eye is more frequently attacked by this disease than the left. It is also, in general, more severely affected, and the sight of it is more frequently lost. In some instances only one of the eyes takes the disease, but, commonly, both suffer from it, although there is often an interval of several days before the second becomes inflamed.

When the symptoms succeed each other with moderate rapidity, the following is the order in which they appear.

A considerable degree of itching is first felt in the evening, or suddenly there arises in the eye the feeling as if particles of dust were between the lids and the eyeball. This is succeeded by a sticking together of the lids, principally complained of by the patient on awakening in the morning. The eyelids appear fuller externally than they ought to do. Their internal surface is inflamed, being tumefied and highly vascular; and the semilunar membrane and caruncula lacrymalis are considerably enlarged and redder than usual. The swelling of these parts is soft, somewhat elastic, slippery, and easily excited to bleed.

We have here all the symptoms of the purely inflammatory stage, and even the symptoms of commencing suppuration. The itching, which is one of the earliest symptoms, indicates a suppression of the natural mucous secretion of the conjunctiva of the eyelids, and of the Meibomian secretion. Such suppression appears to be the constant and earliest effect of inflammation upon every mucous membrane, and secreting organ of the body. In the course of a few hours, a thin acrid secretion takes place from the conjunctiva. This gives the slipperiness to the internal surface of the eyelids; and the Meibomian secretion being now increased above its usual quantity, concretes among the eyelashes, and causes the eyelids to adhere during sleep. The sensation of sand in the eye is owing chiefly to the dilated state of the conjunctival vessels.

In about 24 hours after the first symptoms make their appearance, the mucous discharge from the internal surface of each eyelid is considerable in quantity. It is still thin, but somewhat viscid, and begins to be opaque. It lodges at the inner angle of the eye. On everting the lids, their internal surface is observed to be much more vascular and tumid. The patient is troubled with epiphora, especially when he exposes his eye to a current of air. He complains of a sensation as if the eye were full of sand, but seems to experience little uneasiness from the light, unless he be of a scrofulous habit, and then the intolerance is acute. Not unfrequently, a considerable discharge of blood takes place from the conjunctiva, after which the swelling of the membrane may diminish for a time. This is sometimes repeated more than once before the profuse puriform discharge sets in. The hæmorrhage often appears to arise not so much from actual rupture of vessels, as to be a mere tinging of the inflammatory product of the conjunctiva, through oozing of dissolved colouring matter from the blood.

The inflammation now extends to the whole internal surface of the eyelids. The secretion from the palpebral conjunctiva is much augmented, and becomes more distinctly purulent, being yellowish and thick. In many cases it is so abundant, that on the patient opening his eyes, the matter instantly flows down the cheek. It irritates the skin and even excoriates it. The swelling of the conjunctiva of the lids, and especially of the upper, increases with the discharge; partly from a serous effusion immediately under the membrane, partly from an inflammatory development of its papillary structure, giving rise to a sarcomatous appearance of the internal surface of the eyelids.

The disease may not proceed farther over the conjunctiva, but remain in the state described for weeks or even months, and however severe it may appear to another person, give but little uneasiness to the patient. The purulent secretion may then diminish, and recovery gradually take place.

In other cases, the inflammation spreads rapidly to the conjunctiva of the eyeball. Its vessels are distended with red blood, forming a thick network over the sclerotica, interspersed, in some instances, with small spots, from extravasation. The membrane itself becomes speedily thickened, its semilunar fold is enormously enlarged, and a serous effusion taking place into the areolar tissue which connects the conjunctiva to the sclerotica, the former is raised so as to form a soft pale-red elevation or chemosis. In some cases, this inflammatory œdema exists only at particular spots. It commonly happens that the chemosis gradually spreads from the lids over the surface of the eye towards the cornea, with its advancing edge accurately defined, leaving for awhile a circle round the cornea. Gradually the swelling intrudes on the cornea, till it closely surrounds it, and at last completely buries and overlaps it, so that even its centre can scarcely be seen. The chemosis is sometimes so great, that the conjunctiva of the eyeball protrudes from between the lids.

The chemosis is accompanied by livid redness and swelling of the skin of the eyelids, sometimes extending to a considerable distance from the eye, and resembling very much in colour and general appearance the redness and swelling which surround the cow-pox pustule between the 9th and 12th days after inoculation. This swelling of the lids is often as sudden in its occurrence, as if it had been owing to the stinging of an insect, or some other immediate irritation. It is sometimes seen to advance almost by sensible degrees, and attains its utmost height in a few hours; at other times, it increases gradually during several days. It affects chiefly the upper lid, which often reaches a very great size, completely overhanging the lower, so as to render it difficult to obtain access to the eye for examination

The sudden swelling of the lids renders them almost immovable. It also occasions at first a degree of inversion from the cartilages not yielding with facility; but after a time, the lids are apt to become everted, as has been explained at page 195. This happens especially to the lower, but occasionally to the upper also. The sensations produced by this enlargement of the external parts of the eye are by no means severely painful, scarcely surpassing a sense of stiffness and weight, along with a feeling of uneasiness occasioned by the accumulation of matter secreted by the conjunctiva, which flows in great abundance on raising the lids. The sensation of gravel in the eye is now less troublesome. If light be excluded, and the eyes kept at rest, the patient does not complain much of pain.

After the conjunctiva of the eyeball takes part in the disease, the secretion of puriform fluid is greatly increased, varying, however, from time to time, in quantity, colour, and consistence, as does the discharge in gonorrhœa. Dr. Vetch estimates its quantity as exceeding several ounces in the day. It partly escapes from between the lids, partly lodges in their folds, and in the pit formed over the cornea by the chemosed conjunctiva. In this last situation, the purulent discharge is sometimes allowed, from carelessness, to remain so long, that it assumes the appearance of a thick membrane, so that one unacquainted with the symptoms, on seeing this piece of matter drop from the eye, is apt to suppose that the organ is destroyed, and that it is the cornea in the state of a slough which has separated.

The puriform secretion may continue without much change for 12 or 14 days, or even a longer period. At length the chemosis, which for a time filled up completely the space which exists in the healthy state between the eyeball and the eyelids, begins to shrink, and the fluid secreted to diminish in quantity, and gradually to lose the characters of pus, becoming thin and gleety. The internal surface of the eyelids, the semilunar membrane, and caruncula lacrymalis, which were the parts first affected, are the last in which the disease disappears. The internal surface of the lids generally remains in a sarcomatous state, from the morbid condition of the papillary structure of the conjunctiva. The papillæ, instead of subsiding to their natural size, become indurated, and form a granular, scabrous, or mulberry surface; and this, constantly rubbing against the cornea, keeps up a chronic inflammation in its investing membrane, which becomes covered with red vessels, and loses in a great measure its transparency.

Such may be looked on as a favourable case of the disease. We must be prepared to meet with much more destructive terminations of it. It often happens, indeed, that the tumefaction of the conjunctiva and whole substance of the lids is so great, that we cannot ascertain the morbid changes which are going on in the eye. When this tumefaction declines, so as to admit of the eyeball being exposed, we sometimes find it disorganized. The cornea presents itself in various states; for example, turbid, but entire; of a fleshy appearance, being covered with fungous excrescences; penetrated by one or by several ulcerations, through which portions of the iris protrude; or almost entirely destroyed by suppuration.

We have reason to conclude, that, in some cases, the primary inflammation extends to the cornea. Its conjunctival covering becomes thickened, and more or less opaque. Not unfrequently, the lower half of the cornea is turbid or nebulous, the upper half clear, with the line of division between them well marked. The patient's vision is much affected by these changes; and very frequently the opacity and consequent impairment of vision continue after all the acute symptoms of the disease have disappeared. Superficial ulceration may attack the cornea, the ulcer being sometimes clear, as if a piece of the cornea were chipped off. This is apt to leave the cornea partially flattened, or irregular on its surface, so as thereby permanently to unfit the eye for distinct vision. In other cases, the ulcers, though superficial, are flocculent and whitish, and these are likely to end in opaque cicatrices of various sizes. Even when the ulceration has not penetrated through the cornea, the iris sometimes advances and adheres to its internal surface, opposite to the ulcerated part.

It often happens that the inflammatory process is still more severe, attacking the whole substance of the cornea, and even extending to the internal textures of the eye. The patient is now subject to sharp lancinating pain deep in the orbit, aggravated during the night, and declining towards morning. There is also pulsatory pain in the eye, coming on sometimes in paroxysms, in other instances continuing with scarcely any remission in its violence till the cornea gives way. The varieties, indeed, in regard to the pain, are exceedingly remarkable, depending, no doubt, in a considerable measure on the part which the several textures of the eye take in the disease. For the most part, the attacks of pain are sudden. Occasionally they are preceded by chilliness and slight nausea, or by a peculiar sensation about the head. Frequently the pain, with a remarkable increase of heat, occurs around the orbit, in a degree no less excruciating than in the eye itself. The space over the frontal sinuses, the temples, and the face, are its frequent seats, or to speak more exactly, it affects the branches of the fifth nerve, distributed to those parts. Sometimes it occurs immediately above the eye, commencing about the supra-orbitary foramen. This supra-orbital, or circum-orbital pain is indicative of the inflammation extending to the sclerotica, cornea, choroid, and iris. Inflammation of these textures always excites sympathetic pain in the fifth nerve. The pain round the eye is aggravated by pressure, and occasionally a circumscribed swelling suddenly takes place over the part affected. When such a swelling appears in the face, it partakes of an œdematous nature; and though equally sudden in its accession, does not subside so rapidly during an intermission, as the swellings which rise under the same circumstances on the forehead and temple. At all times, the eye is the most frequent seat of the pain, which is generally described to be of a darting or shooting kind. Sometimes it is compared by the patient to what might be felt if the eye were stuck full of needles, and always appears to be exceedingly severe. It is generally confined to one eye at a time, though it frequently shifts from the one to the other.

The apparent absence of all uneasiness from the presence of light, during the paroxysms, is probably owing to the patient's attention being engrossed by the violence of the pain. The duration of the paroxysms, and their recurrence, do not observe any great regularity. The more common duration appears to be from three to four hours. Sometimes they do not continue longer than two hours, and sometimes they extend to six. They appear to come on most frequently from 10 to 12 in the evening. During the pain, the secretion of tears is more copious, and the purulent discharge, on the contrary, almost uniformly diminished.

This intermittent type of the pain is a remarkable circumstance, and might appear inexplicable, were we not acquainted with the fact, that pain in and round the eye, aggravated during certain hours of the night, is an invariable attendant on sclerotitis. It has already been mentioned, that in many cases there is no entire intermission, and scarcely any remission in the violence of the pain. Dr. Vetch (to whose excellent account of the disease I am indebted for many of the facts stated in this section) tells us, that in those patients who were of a habit particularly robust, or who had been exposed to some strongly exciting cause, or who were of a shape favourable to a determination to the head, there was no entire intermission, and scarcely ever any remission in the violence of the pain.[1]

It is only when the disease assumes its most violent form that it is accompanied by the frequent occurrence of the paroxysms of pain above described, and under these circumstances the rupture of the cornea frequently takes place, an event which is almost always followed by staphyloma and loss of sight. The period at which this happens varies exceedingly in different patients. About the eighth day of the disease is a common period for the cornea to give way; but this event may happen as early as the third or fourth day. In some instances, the paroxysms of pain have occurred daily, during a number of weeks before rupture of the cornea is produced. In others, this is effected under the second or third attack, and gives a temporary relief. I say *temporary;* for even the rupture of the cornea does not afford a termination to the disease, and often scarcely checks its progress. The severe pain is seldom present in both eyes at the same time, and although it occasionally happens that the attacks of pain alternate from the one eye to the other, the rupture of the one is generally produced before the severe pain affects the other. In some cases, where both eyes are destroyed by rupture of the cornea, the patient has no recurrence of the pain for some time after the rupture of the first; while in other cases, the pain almost instantly shifts to the other eye. It has been known that, while the second eye was suffering rupture of the cornea, the first eye, by cicatrizing, was only becoming liable to the same accident again, and this second rupture of the cornea has been preceded by as much pain as was the first.

Rupture of the cornea generally happens when the disease is at the height of its violence, and when the swelling of the external parts is so great, as to prevent an examination of those immediately concerned in the event. From the distinct sensation, however, which the accident uniformly communicates to the patient, accompanied by a copious discharge of hot fluid, we seldom remain ignorant of its having taken place. In other instances, the swelling of the conjunctiva and of the eyelids is not so great as to prevent the inspection of the eye at the time of its rupture. The progress of disorganization may then be observed. The cornea is first dull and hazy, then whitish, and at last, from matter infiltrated more or less extensively into its substance, it becomes yellow. Its lamellæ are, no doubt, softened by the disease, and by this infiltration detached from one another. The cornea swells, and advances gradually out of the pit formed around it by the chemosed conjunctiva. Its surface becomes ulcerated in one or more points. The ulcers rapidly deepen and spread, and at last the cornea gives way. Through the opening, or openings, thus formed, we may sometimes see the clear lens lying in its capsule. It rarely happens that there is any formation of pus, or deposition of coagulable lymph in the chambers of the eye in this disease; and hence, when the cornea is destroyed, the internal parts of the eye appear natural. The patient is sometimes able even to see objects pretty distinctly after the cornea has given way, or is almost quite destroyed by ulceration, and is apt to believe his eye to be nearly cured, or at least out of danger. The iris is pushed into the opening or openings of the cornea; assuming a reddish fungous appearance, it swells and protrudes; union takes place between the iris and the remains of the cornea, lymph is deposited over the front of the eye, a dense cicatrice forms over the protruded iris, and partial or total staphyloma is the result. In some cases, the iris remains protruding at different points, scarcely covered by any cicatrice or pseudo-cornea, but presenting a number of dark-coloured prominences, like the grains of a bramble-berry, a state of parts which is styled *staphyloma racemosum.*

The cornea may give way under one of the violent paroxysms of pain of which I have spoken, before it has undergone much disorganization. Dr. Vetch minutely describes a case, in which, on examining the eye after the patient had felt the peculiar sensation indicating rupture of the cornea, and the discharge of scalding fluid had taken place which attends this accident, he found merely a small line extending across the lower segment of the cornea, and which remained without any alteration after the eye was washed with tepid water. As any attempts to ascertain the nature of this line, gave uneasiness, its examination was left to next day. In the meantime, the patient saw better than he had done before the rupture took place. Next day, the line was more visible along its whole extent, from a slight opacity which accompanied it, and which daily increased, till the greater part of the cornea was not only opaque, but projected in an irregular cone, and as this alteration went on, vision, which for some time after the rupture continued more correct than before, became totally obstructed.

It would thus appear that in certain cases, the aqueous humour escapes by a division of the cornea, nearly as clean as if made with a knife. Were the disease to subside immediately after such a rupture of the cornea, this accident would in all likelihood be attended with little permanent injury to the sight. But, besides the obstacles which the presence of the disease offers to reparation of the cornea, the same causes which produced the first rupture continue to operate, so as to produce a second or a third, the disorganization and deformity increase, and the termination with respect to vision is proportionably unfavourable.

As Dr. Vetch relates one case of this kind of rupture of the cornea with much minuteness, and tells us that he has seen several others of the same kind, I cannot think that he has been mistaken concerning the fact. Yet I am convinced that, far from being the manner in which the cornea generally gives way, this sort of rupture occurs very rarely. One mode in which the cornea is destroyed is by ulceration, commencing on the surface and gradually penetrating into the cornea. An ulcerated trench is seen at some part of the edge of the cornea, where it is overlapped by the chemosed conjunctiva. This trench or groove gradually increases so as to embrace a fourth or a third of the circumference of the cornea, becomes deeper, and at length opens into the anterior chamber. Infiltration of matter into the substance of the cornea, presenting at first the appearance denominated *onyx,* and at length forming complete abscess of the cornea, followed by rupture and ulceration, is another mode of destruction. In some instances, but by no means frequently, the exterior lamellæ slough off in the form of loose leathery scales. Rarely, if ever, does the whole thickness of the cornea come away in this state.

This disease is a very deceptive one. The cornea may look pretty clear, actually clearer than it had done for some days before, although the edge, overlapped by the chemosed conjunctiva, and especially the lower edge, may be falling into ulceration, unobserved. In the morning, expecting farther improvement, we find the cornea given way and the iris protruding. Next day, the protrusion and the cornea are flat. The pain of the eye and head is much less, from the tension being rather off. For some days, the symptoms may go on subsiding. Then, another ulcer forms and bursts in the middle of the cornea, or towards its upper edge, so that we have two protrusions of the iris, the case ending in staphyloma.

In many instances, the progress of the disease is not terminated by the bursting of the cornea. In a few hours, the capsule gives way, the lens escapes through the ruptured capsule and cornea, more or less of the vitreous humour generally follows, and sometimes almost the whole contents of the eyeball are evacuated. In this case, no staphyloma takes place, but a small deformed eyeball is left deep sunk in the orbit, over which the lids fall in, become concave externally, and remain ever afterwards closed.

Although this ophthalmia proves most contagious in warm weather, the symptoms are greatly aggravated by the patient's exposure to cold and moisture. The symptoms are also more severe in females for some days previous to menstruation, and on this evacuation taking place they as constantly become mitigated.

It is always found, when contagious ophthalmia affects any considerable number of persons congregated together, such as a regiment or school, that many relapses take place, whereby the cure is not merely retarded, but the symptoms often become much more severe, and more difficult to overcome, than were those of the original attack. By some imprudent exposure, or some error in diet, more ground is often lost in the course of a few hours, than had been gained by the most assiduous attention and best-directed treatment during perhaps several previous weeks.[2]

The external symptoms of the disease and the pain cease at very uncertain periods. After the severe pain has subsided, the vascularity and sarcomatous tumefaction of the conjunctiva generally remain stationary for a considerable time, and then rapidly diminish. In other cases, this process goes on slowly and gradually. The external tumefaction of the eyelids commonly disappears first, and then the chemosis gradually subsides; that part of the conjunctiva which immediately surrounds the cornea first assuming its natural appearance, and presenting a ring of white similar to what was formerly seen in the advancement of the disease. The white space gradually enlarges till the swelling and vascularity are confined to the semilunar membrane and its neighbourhood, and to the bottom of the folds between the eyeball and eyelids. The eyelids have now a gaping and relaxed appearance from the subsidence of the tumefaction, and a little matter still forms on their internal surface. In this state, which may continue for months, any irritation of the eye or of the system is sufficient to cause a violent relapse, and the patient still continues capable of infecting others.

The rapidity with which the opacities of the cornea caused by this disease frequently disappear, when their removal once begins to take place, is a remarkable circumstance. In many cases of opacity of the cornea, supposed to be perfectly hopeless, the patients have speedily recovered such a degree of vision as to be of considerable use to them. Dr. Vetch mentions the following remarkable illustration of this fact: —

Case 265. — During the convalescence of a man from this disease, some pectoral symptoms, to which he had long been subject, suddenly assumed the appearance of pulmonary consumption, which proceeded rapidly towards its last stage. Five days before his death, he was seized with a violent aggravation of the hectic fever and other symptoms, so that his death was hourly expected. At this time, to the surprise of his attendants, the opacities, by which the vision of both eyes had long been obstructed, disappeared with amazing rapidity, so that a short time before his death, his sight became nearly as distinct as ever. On examining his eyes after death, the remains of the opacity were found to extend to the internal surface of the cornea, which was at the opaque part slightly corrugated. There was also a very partial adhesion of the iris to the cornea in both eyes, which had not been discerned during life.

Especially after repeated relapses, the symptoms which are the latest to disappear are the indurated and hypertrophied state of the papillary structure of the conjunctiva, and the vascularity and opacity of the cornea depending on the irritation produced by the friction of the diseased eyelids. The state of the conjunctiva of which I am speaking has generally received the name of *granular conjunctiva.* If by granular, those who employed this term meant merely that the conjunctiva was extremely irregular on its surface, the name would not be unexpressive nor very improper. It has evidently been used, however, to signify a state of granulation. We have even heard of removing the *granulations* of the conjunctiva. That the prominences in question are not granulations is proved both from the nature of the conjunctiva and from the history of the symptom itself. No mucous membrane is known to throw out granulations, without having been previously ulcerated upon its surface. But in this disease, no ulceration of those parts of the conjunctiva which are affected with this granular appearance has ever existed. If these prominences were really granulations, adhesion between the eyelids and the eyeball would be extremely frequent, whereas this is a very rare occurrence. The granular prominences in question are nothing more than the papillæ of the palpebral conjunctiva, hypertrophied by inflammation.

A principal difference between catarrhal and contagious ophthalmia is, that the latter affects the papillary structure of the conjunctiva with more rapidity and intensity, and is thereby apt to become inveterate. A patient may remain for many months with the conjunctiva of the eyelids in the granular state, his cornea probably vascular and nebulous, but without any puriform discharge, when, after a fit of intoxication, or some other irregularity, the inflammation shall suddenly return in its original form, and with its original propagative power. Hence it may happen that a soldier, discharged in the state described, returning home into the country, and there relapsing, may give rise to an ophthalmia which shall spread through many families, with all the symptoms and severity of the original disease.

Constitutional symptoms.—The system does not appear to be in the smallest degree primarily affected; the early stage is entirely local. The pulse commonly continues soft. The skin is seldom hot. Thirst is seldom remarked. The appetite for food is rather keen than otherwise. The blood drawn is not, in general, buffy. All these circumstances denote how little the constitution is affected in the early stage of the disease. Varieties, no doubt, must occur in this respect. Judging from the accounts given by Dr. Vetch and Sir Patrick Macgregor, we should conclude, that children labouring under this disease are subject to more constitutional irritation than adults. As the local symptoms grow in severity, the constitution begins to suffer. The pulse becomes frequent and sharp. At last, there is always much general uneasiness, and sleep is prevented by the paroxysms of nocturnal pain. The blood, now taken from a vein, is highly inflamed. Great debility comes on, especially when the patient has suffered repeated relapses. Sir James Macgregor states that in Egypt the disease very often continued two or three months, that it much impaired the general health, often terminated in diarrhœa or dysentery, and that sometimes the patient became hectic.[3]

Those patients who are of a scrofulous constitution are more liable than others, to disorganization of the cornea in the course of contagious ophthalmia.

Predisposing causes.—The military life appears to be one of the strongest predisposing causes. This includes the hard exercise of soldiers, their exposure while on guard during the night, their exposure to changes of temperature, their residence in cold, dirty, crowded barracks, bad diet, the excessive use of alcoholic drinks, improper clothing, and various other detrimental influences.[4] Dr. Vleminckx thinks the great predisposing cause is the inconvenient clothing of soldiers, especially their tight collars and heavy caps. Since these have been rectified in the Belgian army, the disease has become less and less.

Propagation of the disease—Contagion—Infection—Epidemic character.—I have already explained my views regarding the propagative power assumed by the common catarrhal conjunctivitis of this country; and have hinted that probably the ophthalmia which arose in the British and French armies in Egypt, and with which they returned to Europe, had a similar origin. Assalini attributes the disease as it occurred among the French, to the vivid light and excessive heat of the country as predisposing causes, and suppressed perspiration as the occasional cause; or, in other words, considers it as a catarrhal ophthalmia. Catarrhal inflammation of the conjunctiva, arising where or how it may, appears speedily to acquire, if it does not from the first possess, the power of producing by contagion a disease similar in nature to itself, but much more severe.

It is undeniable, that the return of the Egyptian expedition introduced a severe contagious ophthalmia into this country, which afterwards prevailed extensively in regiments which had never served in Egypt, and which accompanied the British troops to almost every foreign station to which they were sent. For many ages this ophthalmia has prevailed in Egypt. It is more frequent among the natives of the country than among strangers, owing to the freer intercourse of the former with each other; and for the same reason, more among the lower than the higher classes of society, and more in cities than in the country.[5] But it is not confined in its origin to Egypt, nor to warm countries. It has been known to arise among a ship's crew, far from land. It is probably in a great measure the coldness of this climate, and our attention to cleanliness, which prevent the common catarrhal ophthalmia, which we see every day, from degenerating into the contagious disease.

Whether this disease be capable of propagating itself by infection — that is to say, whether the mere miasmata arising from the eyes of those affected with it, floating through the air, be capable of exciting the same disease in the eyes of others — is a point which still remains in doubt; for in every case in which this ophthalmia has spread through a regiment, school, or family, there has been a suspicion of actual contact, by means either of the fingers of the patients, or of the towels or other utensils which they were in the habit of using in common. Speaking of soldiers, Dr. Vetch says, "Each company has a separate room, in which the intercourse among the men is necessarily great. Many things are used in common; nor are they even over-scrupulous in washing their faces in the same water; and however attentively some may avoid this, they all are under the necessity of having recourse to the same towel." The same author observes, that "All the attendants on the sick, who were particularly careful in avoiding such intercourse as might communicate a local disease, escaped without exception."

The experiments of Guillié, to which I have referred at page 442, fully demonstrate that puro-mucous conjunctivitis is, in the strict sense of the term, contagious; in other words, that the matter taken from an eye affected with this ophthalmia, and applied to the healthy conjunctiva of another eye, will produce the same disease.

Sir Patrick Macgregor has recorded several cases of accidental inoculation with the matter from the conjunctiva in this disease.

Case 266. — A nurse of the Military Asylum Hospital, about 9 o'clock, A.M. when occupied in syringing the eyes of a patient, who had much swelling of both eyelids, with a profuse purulent discharge, found that some of the matter mixed with the injection had spurted into her left eye. She was directed to bathe her eye immediately with luke-warm water. Notwithstanding this precaution, about 7 o'clock in the evening, the left eye began to itch to such a degree that she could not refrain from rubbing it. When she awoke next morning, the eye was considerably inflamed, the lids were swollen, and when she moved the eyeball, she had a sensation as if sand were lodged between it and the eyelids. In the course of the day, purulent matter issued from the eye, and other symptoms followed, which were similar to those in the children under her care. The disorder, however, subsided under the usual treatment in 14 days, the right eye remaining sound during the progress of the disease in the left.

Case 267. — Another nurse, about 8 o'clcok, A.M., while washing with warm water the eyes of a boy suffering severely from purulent ophthalmia, inadvertently applied the sponge which she had used to her right eye. She immediately mentioned this circumstance to the other nurses, but took no means to prevent infection. Between 3 and 4 P.M. of the same day, great itching of the right eye took place, and before she went to bed it was considerably inflamed. Next morning her eyelids were swollen, she complained of pain on moving them, and the whole anterior surface of the eyeball was much inflamed. A purulent discharge also began to trickle down the cheeks from the inner canthus. The symptoms increased in severity, and, notwithstanding the means that were used for her relief, the eyeball burst in front of the pupil, on the 4th day after the application of the purulent matter. The sight of the eye was irrecoverably lost, and the inflammation continued for upwards of three months; but the left eye did not become affected.[6]

The following is a striking, and indeed fearful instance of puro-mucous conjunctivitis, excited by atmospheric influence, spreading by contagion or infection.

The French slave-ship, *Le Rôdeur*, Captain B., of 200 tons burden, left Hâvre on the 24th of January, 1819, for the coast of Africa, reached her destination on the 14th of March, and cast anchor off Bonny. The crew, of 22 men, enjoyed good health the whole voyage, and during their stay at Bonny till the 6th of April. No trace of ophthalmia had been observed among the inhabitants of the coast; and it was not till 15 days after the *Rôdeur* had put to sea, and was nearly on the equator, that the first symptoms of disease were perceived.

It was observed that the negroes, 160 in number, crowded together in the hold and between decks, had contracted a considerable redness of the eyes, which spread with rapidity from one to another. At first, however, the crew paid no great attention to this appearance, imagining that it was occasioned merely by want of fresh air in the hold, and by scarcity of water; for they had already limited the allowance of water to 8 ounces a-day, and some time after they could allow only half a glass a-day. It was thought sufficient to make use of an eye-water made from an infusion of elder-flowers, and, following the advice of the person who acted as ship-surgeon, to bring up the negroes in turns upon deck. This salutary measure, however, they were obliged to abandon; for the poor Africans, torn from their native home, and heart-wrung by the horrors of their situation, embracing each other, threw themselves into the sea.

The disease which had spread among the negroes in a frightful and rapid manner, now began to threaten the crew. The first man of the crew attacked was a sailor who slept under deck, close to the grated partition which communicated with the hold. Next day, a lad was affected with the ophthalmia; and in the course of the next three days, the captain and almost all the crew were seized.

In the morning, on awakening, the patients experienced a slight pricking and itching in the edges of the eyelids, which became red and swollen. Next day the swelling of the eyelids was increased, and attended with sharp pain; in order to lessen which, they applied to the eyes poultices of rice, as hot as they could bear them. On the third day of the disease a discharge of yellowish matter took place, rather thin at first, but which afterwards became viscid and greenish, and was so abundant, that the patients had only to open their eyes every quarter of an hour, when the matter fell in drops. From the commencement of the disease there were considerable intolerance of light, and discharge of tears. When the rice failed, boiled vermicelli were used for poultices. On the fifth day blisters were applied to the nape of the neck of some of the patients; but as the cantharides were soon exhausted, they endeavoured to supply their place by the use of pediluvia containing mustard, and by exposing the swollen eyelids to the steam of hot water.

Far from diminishing under this treatment, the pain increased from day to day, as well as the number of those who lost their sight; so that the crew, besides fearing a revolt among the negroes, were struck with terror lest they should not be able to manage the vessel till they should reach the West Indies. One sailor only had escaped the contagion, and upon him their whole hopes depended. The *Rôdeur* had already fallen in with a Spanish ship, the *Leon*, whose whole crew were so affected with the same disease that they could no longer manage their ship, but begged the aid of the *Rôdeur*, already almost as helpless as themselves. The seamen of the *Rôdeur*, however, could not abandon their own ship, on account of the negroes; nor had they room to receive the crew of the *Leon*. The difficulty of nursing so many patients in so narrow a space, and the want of fresh provisions and of medicines, made the survivors envious of those who died; a fate which seemed to be fast coming upon all, and the thought of which caused general consternation.

Some of the sailors made use of brandy, which they dropped between their eyelids, and from which they experienced some relief; which might have suggested to the surgeon the propriety of a local stimulating treatment.

On the twelfth day, the sailors who had experienced some relief came upon deck to relieve the others. Some were thrice attacked with the disease.

The tumefaction of the eyelids having subsided, some phlyctenulæ were observed on the conjunctiva of the eyeball. These the surgeon had the imprudence to open; a step which proved hurtful in his own case, for he remained blind, without any possibility of recovering his sight.

On reaching Guadaloupe, on the 21st June, the crew were in a deplorable state;

but, very soon after, from the use of fresh provisions, and by simple lotions of spring water and lemon juice, recommended by a negress, they became sensibly better. Three days after coming ashore, the only man who, during the voyage, had escaped the contagion, was in his turn seized with the same symptoms; the ophthalmia running its course as it had done in the others on board ship.

Of the negroes, 39 remained totally blind, 12 lost each one eye, and 14 had specks, more or less considerable of the cornea.

Of the crew, 12 men lost their sight; one of these was the surgeon. Five lost each one eye, and amongst these was the captain. Four had considerable specks, and adhesions of the iris to the cornea.[7]

The history given by Sir Patrick Macgregor of the spread of puro-mucous ophthalmia in the Military Asylum at Chelsea, an extensive institution for the education of soldiers' children, in 1804, appears sufficiently demonstrative of its being propagated from person to person.

"In the beginning of the month of April, 1804," says he, "two boys, brothers, were brought to the Infirmary with their eyes inflamed, but in so slight a degree, as not to require their being admitted. They were made out-patients, and by using the common remedies, got well in eight or ten days. In the end of this month, six boys with ophthalmia were brought to me; three of them had it in a violent degree, and were admitted into the Infirmary; the other three were ordered to attend daily for advice.

"In the month of May, no less than forty-four boys, and five girls, affected with ophthalmia, were brought to the Infirmary. The worst cases were admitted; but there was not room for all, and even some of those that were admitted, were necessarily mixed with other sick.

"On the morning of the fourth day after their admission, two boys who were in the same ward labouring under other complaints were attacked with inflammation of the eyes, and in the course of that week the nurse took the disease. She had it so violently as to be deprived of sight for several days, and rendered unable to do the duty of her situation for about three weeks. About the same time, her son, a boy twelve years old, who had been in attendance on the sick, and a few days after, her two younger children, were attacked, as were several of the sick in the same ward.

"In June, fifty-eight boys and thirty-two girls were attacked. It was in general observed, that they had the disease in a more violent degree than those attacked in May. In the course of this month, the nurse of the Girls' Hospital caught it, and her husband, an in-pensioner of Chelsea Hospital, who came daily to see her, was also seized with it, as likewise were two occasional nurses. Upon inquiry, I found, that the above-mentioned pensioner was the only person at this time affected with ophthalmia in Chelsea Hospital.

"The wife of a field-officer was at this time on a visit at the Military Asylum. She had a son between five and six years of age, who used to play with the other boys. He caught the ophthalmia, and on the fourth or fifth day after it appeared, his sister, a child two years old, was seized, and some days after this the lady herself took it.

"These circumstances gave alarm, and particular attention was paid to the immediate separation of those who had any symptoms of the disease from the other sick, and the other means usually adopted for checking the progress of contagion were had recourse to.

"In July, the ophthalmia continued to spread, and several of those children who had already had it, and were recovered, took it a second time. Sixty-five boys and thirty girls were attacked this month. They appeared to have the disease more severely, and did not so readily get well, as those affected in the preceding months, although treated in the same manner. The weather was much hotter than it had been the month before.

"In August, sixty-nine boys and twenty-one girls caught the disease; a boy and a girl, brought by their mother from Scotland, arrived at the Asylum one evening in the end of this month, and were immediately admitted. The children were put by the nurse, without my knowledge, into a ward occupied by patients affected with ophthalmia; on visiting the Infirmary the next forenoon, I directed the children to be immediately removed into another ward. This was accordingly done;

yet on the third morning after their arrival, both the children had symptoms of ophthalmia, which in no respect differed from what were observed in the others.

"All the boys from five to six and a half years of age are formed into one company. It was observed that in the course of the last and present month, almost the whole of this company took the ophthalmia. Its progress could in their dormitories be traced from one bed to another, in the order in which they were placed, until nearly the whole were affected. The two nurses attached to this company always slept in their wards, and were the only nurses belonging to the institution (those connected with the Infirmary excepted) that suffered from the disease. About the middle of this month, I caught it myself; and though the inflammatory symptoms subsided in ten days, I did not recover from its effects in five or six weeks.

"In September, sixteen boys and four girls took the disease; in October, sixteen boys and seven girls; in November, nine boys and six girls; and from the twenty-second of this month to the end of December, only two instances of it occurred, and these were in two boys, brothers, who had slept together, and had laboured under the disease in the month of August in a violent degree.

"From the above statement of the progress of this ophthalmia, there is much reason to suppose that it was contagious. For if the disease had been first produced, and afterwards kept up, by any general cause (as a peculiar state of the atmosphere), the girls would have been as subject to it, in the first instance, as the boys, and the officers, serjeants, and nurses of the institution, generally, would have been as liable to it as the persons of the same description that were immediately about the sick. But this was not the case; it had prevailed among the boys for near a month before the girls were attacked, and, as appears by the preceding statement, all the adults who did not mix with the sick escaped the disease, while those who were connected with them all suffered from it, the assistant-surgeon excepted.

"The disease sometimes showed itself as early as the third day after exposure to infection. This was clearly proved in the cases of the two children from Scotland.

"It would appear also, that closer connection with the affected person was necessary to produce it, than what is requisite in most other contagious diseases. This may be inferred, from the servants of the Infirmary, and the two nurses that attended the little boys, taking it so readily, while the other servants of the institution escaped it.

"It was influenced by the state of the atmosphere, being much more severe in its attacks, and of longer duration, in hot sultry weather, than during cold or moderate weather. This was clearly seen in July, August, and September, when the disease was unusually severe, and of longer duration than before or after those months.

"There is reason to think, that it was most contagious in its early stage, when the inflammation was active, and there was a considerable purulent discharge."[8]

While the generally received opinion, and one upon which it is wise to act, is, that this ophthalmia is contagious, some have inclined to the opposite way of thinking. Mr. Lawrence, for instance, expresses[9] a doubt, whether the spread of this complaint, especially among soldiers, is owing to the application of a contagious matter, or to those unfavourable effects upon health which arise when many individuals are crowded together. Dr. Eble, while he acknowledges the possibility of the disease being propagated *per contactum*, thinks that it spreads much oftener by infection *in distans*.[10] Mr. Roberts, after a careful investigation of the disease as it occurred in Malta, adopts the view of its being propagated by contagion. He mentions that in the 59th Regiment, to which he was attached, it commenced among the children, extended itself to the women, then to the married men, and lastly to the single men of the regiment.[11]

This ophthalmia resembles other epidemic contagious diseases. The epidemic constitution, as it is termed, operates in its production, and modifies its phenomena, as it does in influenza, typhus, plague, dysentery, cholera, &c., all of which seem to become contagious. Like these diseases, this ophthalmia often follows an irregular and inexplicable course, attacking one place and sparing the neighbouring places, manifesting remissions which we cannot account for, and as unaccountable exacerbations. At one time, the inflammation is so severe that all attempts to subdue it fail; at another, the disease shows a general tendency to yield, and every effort proves successful in accelerating the cure. A series of causes, probably, and not one alone, operates in producing this ophthalmia, such as it formerly occurred in the British army, and has recently proven so destructive in the Belgian and other continental armies. An altered condition of the atmosphere in the first instance, produces an epidemic catarrhal ophthalmia, which afterwards spreads from person to person in consequence of the transmission of a morbific principle through the air; while, in some cases, the disease is propagated by the immediate application of the purulent discharge from the conjunctiva.

Treatment. The treatment by which the cure of contagious ophthalmia is best promoted consists, on the one hand, of antiphlogistic means, and, on the other, of astringents. Let no man who feels anxious for the welfare of his patient neglect either the one or the other; but carefully employ both.

Constitutional treatment. — 1. *Blood-letting.* When we have the charge of the patient from the beginning of the disease, and the symptoms are moderate, the treatment already recommended for catarrhal ophthalmia will generally be successful. Should we be later of being called in, and chemosis be already present, bleeding from the arm or temporal artery, to the extent of from 10 to 20 or 30 ounces, according to the age and constitution of the patient, followed by leeches round the eye, will be necessary, and may be repeated according to circumstances. The blood from the arm should be taken from a large orifice. The leeches, in number from six to twenty-four, should be applied within two hours after the bleeding from the arm. Leeches *en permanence* behind the ears are likely to do good.

We ought neither to delay the abstraction of blood, if the symptoms are acute, and the case of some days' standing; nor ought we, on the other hand, to indulge in the expectation that profuse blood-letting is to check the disease completely, without the use of local applications. I hold any notions of this kind, which some may have entertained, as crude and irrational, and their practice as perhaps the most destructive which could be followed. By very profuse blood-letting, the patient is too much reduced, and the eye rendered more susceptible of disorganization. We must not for a moment indulge in the fancy that the stream of blood is to be allowed to flow, till the redness of the eye fades under our view, nor are we even to make the cessation of pain the condition for stopping the bleeding. These effects might not be obtained by abstracting 50 or 60 ounces of blood, whereas the same real benefit will follow in the course of an hour or two, although not more than 20 or 30 ounces be taken, the patient will be less debilitated, and the course of the disease with greater certainty abridged.

Venesection may with propriety be repeated, or blood may be taken from the temple by cupping, if in the course of 24 hours, the symptoms have not abated, or have increased in severity. Afterwards, also, should there be any signs of a renewal of inflammatory action, more blood is to be taken away. It is chiefly in cases where there is pulsative pain in the eye, and circum-orbital pain, coming on in nocturnal paroxysms, that repeated general blood-letting is necessary.

Besides venesection, cupping, and the application of leeches, scarification of the conjunctiva of the eyelids, and even of the eyeball, is to be employed. This may be repeated every second or third day, or even every day. In the swollen and fleshy state of the conjunctiva which attends this disease, an incision may be made, first along the inside of the lower eyelid, and then along that of the upper; they will bleed very copiously, and greatly allay the symptoms. If the state of the lids permit the eyeball to be sufficiently exposed, the conjunctiva should be divided by several radiating incisions, proceeding from the edge of the cornea towards the periphery of the eyeball. This will be best effected by a small scythe-shaped knife, such as is recommended and figured by Mr. Haynes Walton.[12] It is also a useful practice to snip away one or two of the folds of swollen conjunctiva, which project from between the eyelids. This causes a profuse discharge of blood. I am disposed to place scarification of the conjunctiva, and the snipping away of one or two of its folds, among the most effectual means of combating the disease.

2. *Regimen.* The patient is to remain at rest, in a well-ventilated apartment, his eyes shaded from the light, and to adhere strictly to the antiphlogistic regimen.

3. *Purgatives.* In mild cases, blood-letting, at least general blood-letting, will not be necessary; but in all cases purgatives are to be used. A dose of calomel and jalap may be given at first, and either repeated from time to time during the course of the treatment, or changed for some of the neutral salts. Purgatives operate not merely by depleting, but have a strong sympathetic effect upon the conjunctiva. Emeto-purgatives, as tartar emetic with sulphate of magnesia, will be found highly useful.

4. *Diaphoretics.* As soon as the active inflammation is subdued, much advantage will be derived from promoting the action of the skin. For this purpose the warm pediluvium is to be used at bedtime; after which the patient may take from 10 to 20 grains of Dover's powder. The action of these remedies may be assisted by draughts of tepid diluents, and during the day by small doses of antimony or acetate of ammonia.

5. *Alteratives.* Next to copious venesection, no remedy will be found more useful in severe cases, attended by nocturnal circum-orbital pain, than calomel with opium. Two grains of calomel, with from one quarter of a grain to a whole grain of opium, may be given in the form of pill, every second hour, or thrice a-day, or only at bedtime, according to circumstances, till the mouth is sore. This combination may be used, from the first, with advantage, even although severe nocturnal pain is not yet present.

Should any cause prevent our using mercury, iodide of potassium may be substituted in its place.

6. *Bark* and other *tonics* are to be given only in the chronic stage. They are then highly useful.

Local Treatment.—If no local remedies are employed, or only improper ones, the eyes may be lost, notwithstanding the best-directed general treatment. It may to some appear paradoxical that the local applications in this disease ought to be alternately soothing and stimulating. Were we to trust to either sort alone, we should endanger the eyes. Soaking them constantly with tepid water, or laying emollient cataplasms over them, would be almost certain destruction; and, on the other hand, a perpetual succession of stimulating solutions and salves would be not less detrimental. The bad effects of a continued soothing or emollient local treatment, are well illustrated in the history already quoted of the French slave-ship at sea, while the good effects of stimulants are shown by the rapid improvement which followed the negress's prescription of lemon-juice, on the patients going on shore at Guadaloupe. Applications which smart the eye are also employed by the native Africans in their own country for the cure of this ophthalmia.[13] The Arrowawk Indians in South America employ the expressed juice of the root of the bignonia ophthalmica with great success.[14] Urine, sea-water, solution of common salt, solution of alum, and many similar substances, have been found useful for the same purpose.

1. *Cleaning the eyes.* The first point in the local treatment is to clean away completely and frequently, in the course of the day and night, the puriform discharge. This is to be done with a small piece of soft clean sponge, while the patient lies on his back. The fluid which I recommend is a tepid solution of 1 grain of corrosive sublimate, with 6 grains of sal ammoniac, in 8 ounces of water, to which are occasionally added 2 drachms of vinum opii. This not only cleans the eye, but acts as a gentle astringent. It is still more efficient, to inject the same collyrium into the sinuses of the conjunctiva with a small syringe, the fluid being sent over the whole surface of the diseased membrane with considerable force; and especially into the fold between the eyeball and the upper lid. The use of the syringe, however, in no small degree endangers the eyes of the operator, as is shown in Case 266.

2. *Astringents—Escharotics.* With regard to other astringents, my experience leads me decidedly to condemn sugar of lead, in whatever form: nor can I speak favourably of sulphate or acetate of zinc. Some highly recommend a solution of alum, while others trust to solid sulphate of copper, rubbed over the internal surface of the eyelids.[15] I consider a solution of nitras argenti as the best remedy for constringing the inflamed vessels, allaying the painful feeling of sand in the eye, and lessening the discharge. I have tried this solution in various degrees of strength, and consider 10 grains to the ounce of simple distilled water, as recommended by Dr. Ridgway[16], to be, in general, the most suitable. The solution may be applied every five or six hours, or as soon as the raw, painful feeling in the eye is renewed. It is to be taken up with a pretty large camel-hair pencil, with which first the inside of the upper eyelid is to be well brushed, and then that of the lower, not omitting any of the folds formed by

the chemosed conjunctiva. We generally find a very marked improvement in the course of 24 hours under the use of this application. Circumstances may lead the practitioner to vary the strength from 2 to 10 grains. It may be well to begin with it weak, and see how it agrees: if weak, it may be used oftener. Should it disappoint our expectations, and the purulent discharge run on unabated, recourse may be had to a salve containing from 10 to 20 grains of the nitrate of silver in an ounce of axunge, or the inside of the lids may be touched rapidly with the lunar caustic pencil. Some practitioners trust almost entirely to this last means, to the exclusion even of depletion of any kind.[17] They apply it once or twice a-day, chiefly or only to the inside of the lower eyelid. I conceive that if only caustic is employed, without depletion, the eye is very likely to be lost. Depletion enables us to use astringents and escharotics with more effect and less danger. Red precipitate salve, of the strength of 30 grains to the ounce of axunge, has been found useful as an application to the conjunctiva, and may be substituted for the preparations of lunar caustic.

These two local applications, the nitrate of silver solution, and the corrosive sublimate wash, cannot be managed by the patient himself, and can rarely be trusted to a nurse: they should be used by the practitioner.

3. *To prevent the lids from adhering*, recourse is to be had to the red precipitate, or the citrine ointment, melted on the end of the finger, and rubbed along the edges of the lids at bedtime. I generally anoint the edges of the lids each time I apply the solution of the nitras argenti. One or other of these applications fulfils not only the intention here stated, but operates in subduing the inflammation. Indeed, Sir Patrick Macgregor states[18] in his first paper, that of all the remedies that were employed in the Military Asylum, the citrine ointment was found the most frequently successful.

4. *Counter-irritants* are highly serviceable in this disease, and ought always to be employed. There is generally a marked change in the quantity and appearance of the discharge from the eye as soon as a counter-discharge is established by blisters on the temples, on the nape of the neck, or behind the ears.

5. *Opiate fomentations, and friction.* Considerable relief to the pain of the eye is sometimes obtained from allowing the steam of hot water with laudanum, to rise into the eyes from a teacup; or from fomenting the eyes with warm decoction of poppy-heads. Rubbing the head with warm laudanum when the circum-orbital pain threatens to commence, is also highly useful.

6. *Dilatation of the pupil.* Although it is rarely the case that adhesions of the iris form in any of the puro-mucous opthalmiæ, unless to the cornea in consequence of penetrating ulcers, still in case adhesions should occur, it is proper to paint the eyebrow and eyelids with the extract of belladonna, so as to dilate the pupil. This ought always to be done when ulcer of the cornea occurs.

7. *Evacuation of the aqueous humour* has been adopted as a means of relieving the severe pain of the eye and head, and of preventing bursting of the cornea. This is a practice of the utility of which in

contagious ophthalmia I can say nothing from my own experience; nor do I conceive it will often be required if the remedies already recommended be had recourse to. Sir Patrick Macgregor expresses his conviction, that many have lost their sight from rupture of the cornea, whose eyes might have been saved by a timely and judicious performance of this operation. Within two years he had performed it in twenty-three instances, with a degree of success which strongly induced him to recommend it.

8. *Solid caustic to ulcers of the cornea.* In cases of ulcers of the cornea, much advantage is derived from the use of the lunar caustic pencil, sharpened to a point, and applied for an instant to the spot. The good effects of this application are often very striking, where a small portion of the iris protrudes through an ulcer. Yet this is a practice not altogether exempt from danger; for if a myocephalon is touched with caustic, the aqueous humour is apt to be discharged; the cornea, consequently, becoming flattened, may not again become plump, and hence vision will be permanently impaired.

9. *Vinum opii.* When the purulent discharge is gone, or nearly so, the vinum opii, pure or diluted, proves an excellent application to the relaxed conjunctiva. It is sometimes advantageously combined, in this stage of the disease, with a solution of the lapis divinus.

Granular conjunctiva and nebulous cornea, two important sequelæ of contagious ophthalmia, I shall consider in a separate section. Of the eversion of the lids, which occasionally proves a troublesome attendant on this ophthalmia, I have already treated at p. 195.

Prevention. To military surgeons especially, the means of preventing this destructive disease are of high importance. Some of the following rules they will at all times be able to follow; the others must depend on the higher military authorities: —

1. Supposing troops to be sent to any of the countries where this disease prevails, it would be necessary to guard them as much as possible against the exciting causes of catarrhal ophthalmia, in which it appears that the contagious disease originates. It is found in Egypt that exposure to the night air is extremely apt to bring on the ophthalmia of the country. Soldiers on guard, then, or at bivouac, should, during the night, cover their heads well; and, if in moist and cold situations, avoid currents of air as much as possible. Dr. Vetch mentions that of four officers who slept in the same tent, in Egypt, two took the precaution to bind their eyes up every night when going to rest, and the two others did not; the latter were in a very short time attacked by the disease, while the other two escaped.

2. Heavy caps and tight stiff collars ought to be laid aside.

3. As soon as there are any appearances of puro-mucous ophthalmia in a regiment, a daily and minute inspection by the medical officers of every individual belonging to it becomes a duty of the first moment, both for the sake of those who may have caught the disease, and for the sake of their comrades.

4. Those in whom the disease is detected should instantly be separated from the rest, and not join their companies till they are perfectly cured, and have passed several weeks in an establishment removed some miles from the place where they were attacked.

5. Those patients who are found to be liable to frequent relapses, or who are affected with obstinate granular conjunctiva, should be invalided or sent to a distance.

6. Excessive crowding of the men together, especially in their dormitories, must be carefully avoided, as this of itself appears very much to promote the contagious power and spread of the disease, and to prevent its cure. A well ventilated hospital, in a wholesome open situation, is to be chosen. The beds are to be placed asunder. Proper means for disinfecting the air, clothing, utensils, &c., are to be adopted.

7. Those exposed to the disease ought to be made acquainted with the fact of its contagious nature, and warned against the modes in which it is likely to be communicated; as, touching the eyes of the diseased person and then touching inadvertently their own, using the same towel as those affected with the ophthalmia, and the like. Barrack-towels must afford a constant medium for the communication of this disease; they ought, therefore, to be discarded, and every man furnished with a towel for himself.

8. It will be found a salutary practice frequently to parade the men, in their respective companies, with separate vessels of water, while an officer attends to see their faces and eyes carefully washed.

9. A regiment attacked by the ophthalmia should move from the station where the disease seems to be epidemic.

10. If the number be great who have suffered from the ophthalmia, they should be formed into a battalion, into which no fresh recruits are to enter, and which should be removed to a wholesome locality, and not re-admitted into the service till after several months' separation.

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[1] Account of the Ophthalmia which has appeared in England since the Return of the British Army from Egypt, p. 117; London, 1807.

[2] See Sketch of the Medical History of the 47th Regiment, by George Saunders. Medical Times, August 30. 1851; p. 227.

[3] Medical Sketches of the Expedition to Egypt from India, p. 151; London, 1804.

[4] "Athlone is well known as a locality where ophthalmia constantly prevails. Nearly every regiment quartered there for many years past appears to have been affected with the disease. I believe the main cause of its prevalence there depends upon the great exposure of soldiers at night-time, mounting guard on those cold, bleak, unprotected positions upon the batteries and lines adjoining the bank of the River Shannon. The atmosphere is the dampest that I ever experienced, except perhaps in India, during the rains. The cold damp wind, coming down off the lake and the bogs at night, used to give the men the ophthalmia as if *struck* by the disease. I have seen four, and sometimes six men come off guard into hospital, with severe conjunctivitis, who had mounted guard perfectly well. I know not if you are aware that soldiers' guard-rooms are about as small as they well can be; and that, when a sentry is relieved, he goes into the guard-room, where he and his comrades lie down, in their great coats, all together, huddled as close as possible. They shut the doors and windows, and light a large fire, and are consequently almost stewed. Then, when it comes again to their turn to go on sentry, they change *at once* from this great heat to a two hours' watch on the lines, exposed to the cold damp wind I have described. I am satisfied that it is this atmospheric influence, and this sudden transition, that produces ophthalmia at Athlone." Letter from Dr. Massy, of the 31st Regiment, in Mr. Wilde's valuable Report on the Epidemic Ophthalmia in the Workhouses and Schools of the Tipperary and Athlone Unions; London Journal of Medicine for January, 1851, p. 17.

[5] In Egypt many causes occur to produce ophthalmia; such as, the exhalations from the soil after subsidence of the Nile, sleeping upon the house-top, or in an uncovered apartment; the dust during the sirocco, or hot wind from the desert; the flies, which are allowed unmolested to stick on the eyes of the children, and suck the

diseased secretions; filthiness, and a notion that loss of sight would result from washing the eyes, when inflamed; &c. See Lane's Modern Egyptians, and other works on Egypt.

[6] Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; Vol. iii. p. 52; London, 1812. Similar cases are recorded by Deconde, Bulletin Médical Belge, Avril, 1837, p. 54.

[7] Bibliothèque Ophtalmologique, par M. Guillié; Tome i. p. 74; Paris, 1820.

[8] Op. cit. p. 31.

[9] Lectures on Surgery, London Medical Gazette; Vol. vi. p. 745; London, 1830.

[10] Eble, Ueber die in der belgischen Armee herrschende Augenkrankheit; p. 10; Wien, 1836.

[11] Medical Gazette; Vol. xxvi. p. 23; London, 1840.

[12] Operative Ophthalmic Surgery; fig. 80, p. 266; London, 1853.

[13] Winterbottom's Account of the Native Africans in the Neighbourhood of Sierra Leone; Vol. ii. p. 129; London, 1803.

[14] Duncan's Medical Commentaries; Vol. xix. p. 368; Edinburgh, 1795.

[15] O'Halloran's Practical Remarks, p. 12; London. 1824.

[16] London Medical and Physical Journal; Vol. liii. p. 122; London, 1825.

[17] Walker's Oculist's Vade-mecum, p. 40; London, 1843.

[18] Op. cit. p. 42.

SECTION VIII. — OPHTHALMIA OF NEW-BORN CHILDREN.

Syn. — Blepharitis puriformis neonatorum. Lippitudo neonatorum.

Fig. Ammon, Thl. I. Tab. I. *figs.* 1–6. Dalrymple, Pl. IX. *figs.* 1, 2.

Infants are subject to a puro-mucous inflammation of the conjunctiva, commonly denominated *ophthalmia neonatorum* or the *purulent ophthalmia of infants.* This affection generally occurs within a week after birth; sometimes not for three or four weeks.

Causes. — The cause is not uniform: —

1. There is reason to believe that this disease is, not unfrequently, an inoculation of the conjunctiva by leucorrhœal fluid, during parturition; and that, therefore, it might often be prevented, by repeated injections of tepid water, or a weak alkaline solution, into the vagina in the first and second stages of parturition, and by carefully washing the eyes of the infant, as soon as it is removed from the mother. The former precaution is scarcely ever, and the latter too seldom attended to. The practitioner ought to acquaint himself beforehand with the fact, whether the mother is affected with any vaginal discharge, and be prepared to use the means proper for averting the danger thereby arising to the child. If the vaginal discharge is not removed, or if, on the child being born, nothing is done to it for perhaps half an hour or longer, every chance is given for inoculation of the eyes. It will, in general, be found that, when the child becomes affected with this ophthalmia, the mother had leucorrhœa, and that the eyes were not cleaned for some time after birth. Like a disease communicated by contagion, this ophthalmia is sudden in its attack, and much more violent than we almost ever see catarrhal ophthalmia, so that it resembles in this respect the Egyptian, or the gonorrhœal inflammation of the conjunctiva.[1]

2. That the purulent ophthalmia of infants, in its worst form, is the result of the application of gonorrhœal matter, during the passage of the head through the vagina, is generally admitted. The same precautions, during parturition, ought to be used when the mother is known to have gonorrhœa, as when she is affected with leucorrhœa.[2]

3. Exposure to the light, to the heat of the fire, or to the cold draught from the door, are all likely enough to have an injurious influence on the eyes of the new-born infant; and, accordingly, some have been led to attribute the purulent ophthalmia which so frequently shows itself after birth, to these causes. That some of the milder cases are catarrhal, is by no means unlikely.

4. I have little doubt that this ophthalmia is frequently traumatic, being occasioned by intrusion into the eyes of the soap with which the child is washed, or the whisky or gin which is absurdly rubbed over its head. Such intrusion may happen immediately after birth, or in the course of the first two or three weeks. Even when the spirits do not touch the eyes, but are merely rubbed over the head, they are likely to excite inflammation of the conjunctiva. If they go into the eyes, this effect is almost certain.

Symptoms.—It is commonly on the morning of the third day after birth, that the upper eyelid is observed to be somewhat swollen, its edge red, and the eyelashes glued together by concrete purulent matter. On opening them, a drop of thick white fluid is discharged; and on examining the inside of the lids, they are found extremely vascular and considerably swollen. I am perfectly convinced of the purulent appearance of the discharge, as early as the third day after birth, and first morning of the disease being noticed. But it is not always distinctly purulent at this early stage; for some days it may continue thin, like mucus or serum, and without almost any opacity. It afterwards presents a diversity of colour in different cases, being whitish yellow, greenish yellow, and sometimes mixed with blood. The discharge is apt to lie, as if coagulated, between the folds of the conjunctiva, unless carefully removed.

First one eye is affected, and in a few days the other also. If neglected, as this disease but too often is, or treated with some such useless application as a little of the mother's milk, the lids swell externally and assume a dark red colour, the inflammation of the palpebral conjunctiva rapidly increases, and the purulent discharge becomes very copious. The infant keeps the eyes constantly shut. It is the palpebral portion of the conjunctiva, and the fold formed by its reflexion to the eyeball, which are chiefly inflamed. The ocular portion is much less affected, and hence chemosis, so as to overlap the cornea, is rarely seen in ophthalmia neonatorum.

In this state the eyes may continue for eight days, or a few days longer, without any affection of the transparent parts, except perhaps slight haziness of the cornea, and redness of its edge. About the 12th day, however, the cornea is apt to assume an opaline tint, indicative of approaching ramollissement, or it becomes partially infiltrated with pus. This infiltration extends, the texture of the cornea is thereby speedily destroyed, it gives way by ulceration, first of all exteriorly to the pus effused between its lamellæ, and then through its whole thickness, and this either in a small spot only, or over almost its whole extent; so that sometimes we find only a small penetrating ulcer, with the lower part of the iris pressing through it; in other cases the whole cornea gone, the iris exposed, and the humours bulging through the pupil.

The lens often comes away. A poor woman from Paisley, who had trusted to the opinion of her midwife, that the disease was common and not at all dangerous, brought me her child, aged five weeks. She had with her, wrapped up in a bit of rag, the left lens, dry and shrivelled, it having that morning been discharged through the ulcerated cornea. I put it in water for a few hours, when it became plump and transparent. It was enclosed in its capsule. On submitting some shreds of the lens to the microscope, the fibrous texture was quite evident. The right cornea was opaque, and partly ulcerated.

It is melancholy to reflect on the frequency of destroyed vision from this disease, especially as the complaint is, in general, completely within control, if taken in time and properly treated. The attendants are not alarmed sufficiently early, by merely a little matter running from the eye; and but too often it happens that medical practitioners are betrayed into the false supposition, that there is nothing dangerous in the complaint, till the corneæ burst, and the eyes are destroyed. Many children have been brought to me in this state; but the most deplorable instance of the disease which I have witnessed, was that of twin infants from Perthshire, for whom I was consulted some time ago. One of the children had totally lost the sight of both eyes, while the other retained but very partial vision with one eye.

Infants labouring under this ophthalmia are fretful and uneasy, and rest ill during the night. The tongue is white, and the bowels deranged. If the disease is neglected, the flesh wastes away and the integuments become loose and ill-coloured.

Epidemic.—I have frequently remarked, that ophthalmia neonatorum was much more frequent at certain seasons than at others. This epidemic character has also been observed by M. Dequevauviller, in the *Hospice des Enfans Trouvés*, at Paris. On one occasion, the epidemic in that institution was attended by a scaly eruption on the eyelids and forehead, and, on another, was characterized by the rapid course of the ophthalmic symptoms.[3] It is stated, on the authority of M. Trousseau, that when puerperal diseases prevail in hospitals, such as peritonitis, suppurative fever, gangrene of the vulva, &c., new-born infants become subject to an ophthalmia, which at first seems simply catarrhal, but which, in three or four days, ends in perforation of the cornea.[4]

Prognosis.—If the disease is recent, and the corneæ are only free from ulceration, and from purulent infiltration, how violent so ever the inflammation and profuse the discharge, our prognosis is favourable—the sight, in general, is safe. If the disease has been allowed fairly to establish itself, and its progress not interfered with for eight days or longer, it often proves tedious; six, eight, or ten weeks elapsing before it is perfectly cured. It is always more difficult to overcome, when the child is exposed to cold damp air, ill nourished, improperly fed, or when the nurse drinks spirits or porter. If there is superficial ulceration, without onyx, probably a slight speck may remain. If the ulceration is deep, an indelible opacity may be the consequence. If the iris is protruding through a small penetrating ulcer, the pupil will be permanently disfigured, and vision more or less impeded. If the ulcer is directly over the pupil, the probability is that the pupillary edge of the iris will adhere to the cicatrice, and vision be lost until an artificial pupil be formed in after-life by an operation. If there is a considerable onyx, we can promise nothing; for although, under proper treatment, the matter may be absorbed, this is by no means a certain result; the lamellæ exterior to the onyx are much more likely to ulcerate; and the purulent exudation may even increase to such an extent that the cornea shall give way, and the eye become partially or totally staphylomatous. Whenever the person who brings the child to me, announces that the disease has continued for three weeks or longer, without any thing having been done for its relief, I open the lids of the infant with the fearful presentiment that vision is lost, and but too often I find one or both of the corneæ gone, and the iris and humours protruding. In this case, it is our painful duty to say that there is no hope of sight.

The most dangerous variety of ophthalmia neonatorum is that which arises from gonorrhœal inoculation. In this case, unless the disease is taken early and treated energetically, one or both eyes are likely to be lost. In gonorrhœal cases, there is much swelling of the lids and conjunctiva, the pain is severe, and the yellowish or greenish discharge very copious.

Like all the other violent puro-mucous inflammations of the conjunctiva, ophthalmia neonatorum is much more destructive in cases where the eyelids are small, and press more than ordinarily on the eyeballs, than when the fissure between them is long, and their sinuses ample.

Central capsular or capsulo-lenticular cataract is by no means an uncommon result of ophthalmia neonatorum. It is met with in cases where there has been no penetrating ulcer of the cornea. The capsule appears to have partaken in the inflammatory action, and become partially albuginous. In other cases, from the co-existence of a small central opacity of the cornea, there is a suspicion that the cornea had given way from ulceration, and allowed the capsule to advance into contact with the ulcerated point, after which the ulcer had healed, and the aqueous chambers again become plump. The opacity of the cornea, when such exists, does not always exactly correspond to that of the lenticular body. The opacity is often no bigger than a pin-point; in other cases it is more extensive; but is seldom, if ever, so large as the pupil. Whether it occupies the anterior capsule only, or partly also the lens, it is accurately circumscribed, the capsular part being more densely opaque than the lenticular, while the circumference of the lens is perfectly transparent. I have not observed this opacity to be in any case totally removed, and have scarcely seen it diminish in any degree. As the child grows, vision improves, in consequence of the expansion which the pupil undergoes; the cataract remaining of its original size. Short-sightedness is one of the results of the central cataract.

Oscillation of the eyes, strabismus, asthenopia, and incomplete amaurosis, are occasional sequelæ of ophthalmia neonatorum.

The purulent discharge in ophthalmia neonatorum is highly contagious; a melancholy example of which I witnessed at the Glasgow Eye Infirmary, in an infant and its grandfather, the latter inoculated from the former. Both were so severely affected, that the infant had the one eye left in a state of total, and the other of partial staphyloma; while in each eye of the old man, the greater part of the cornea remained opaque and adherent to the iris.[5]

Treatment. — 1. As it is of the utmost importance to remove the purulent discharge, from time to time in the course of the day, I may be excused for explaining minutely how the eyes are to be cleaned. Unless the discharge is removed with regularity and care, other means will fail in curing the disease. The surgeon lays a towel over his knees, on which to receive the head of the child, which the nurse, sitting before him, lays across her lap. Every person bringing a child with ophthalmia neonatorum to an Eye Infirmary, should be supplied with a separate bit of sponge for cleaning the eyes, lest by using the same sponge for different children, we may re-infect the eyes when they are beginning to get better. The fluid which I commonly use for washing the eyes, is a tepid solution of 1 grain of corrosive sublimate, with 6 of sal ammoniac, in from 8 to 12 ounces of water. The lids are opened gently, and, with the bit of sponge, the purulent discharge which gushes out is removed. The lower lid, and then the upper, are next everted, and wiped clean with the sponge. The upper lid has a tendency to remain everted, especially if the child cries. This is overcome by pushing the swollen conjunctiva into its place, and bringing down the edge of the lid. All this ought to be repeated three or four times, or oftener, in the 24 hours, by the nurse, or by the surgeon. Washing out the discharge with a syringe is more effectual; but the surgeon only should attempt this, and if he does so, should guard against the fluid injected spirting, along with the discharge, into his own eyes. The impetus, however, with which a fluid is sent over the cornea by a syringe is not altogether free from danger, but is apt to bring on or to increase ulceration. The use of the sponge is sufficient and safe.[6]

2. The corrosive sublimate collyrium, used in cleaning the eyes, tends gently to repress the discharge. Alone, however, it is not sufficient for that purpose, and we have recourse, therefore, to astringent applications of more power. The solution of nitras argenti is what I have found most useful. The strength of the solution should vary, according to the state of the conjunctiva and the duration of the disease, from 2 to 10 grains to the ounce of distilled water. In recent cases, where there is little thickening of the conjunctiva, a weak solution is to be used; when the disease has gone on for a week or more, and the membrane has already become hypertrophied, a stronger solution will be required. With a large camel-hair pencil, the solution is to be applied to the whole surface of the inflamed conjunctiva, immediately after it has been cleaned as above described. This application ought to be repeated every six or eight hours. Not only the local, but even the constitutional good effects of removing and restraining the purulent discharge are very remarkable. The first night after the use of the collyrium and drops, we generally find that the infant has been much quieter than it had been when the dis-

ease was neglected. In two or three days the eyes begin to open; and in ten or twelve days the acute symptoms are overcome.

3. To prevent the eyelids from adhering together, the red precipitate ointment, melted on the end of the finger, is to be applied along their edges, whenever the child goes to sleep.

4. The above remedies are perfectly sufficient to remove this disease, if had recourse to within two or three days after the first symptoms have shown themselves. I have seen two applications of the nitras argenti solution, viz., on the third and fourth days after birth, or first and second days of the disease showing itself, remove the complaint completely, although thick white matter was flowing from the conjunctiva. In cases attended by a discharge less distinctly puriform, the use of the red precipitate salve at bedtime has sometimes been sufficient. In cases, again, which have been neglected for perhaps eight or ten days, it is necessary to take away blood from the external surface of the upper eyelid by the application of a leech, or from the inflamed conjunctiva by scarification. The former may be tried in the first instance; and unless followed by marked abatement of the redness and swelling on the inside of the lids, the conjunctiva may next day be divided with a lancet. The taking away of blood in either of these ways is productive of much benefit, and ought by no means to be omitted, if there be much swelling of the lids, any tendency to chemosis, or haziness of the cornea. A more profuse loss of blood than can be obtained by the methods here recommended, I do not consider necessary. It may be proper, however, to leech or to scarify repeatedly.

5. Should the conjunctiva threaten to assume the sarcomatous or granular state, scarification should be used, after which, if there is no ulceration of the cornea present, the inside of the lids may be rubbed with a smooth bit of sulphas cupri. For the same purpose, a salve containing 10 grains of nitrate of silver in 1 ounce of axunge may be applied to the palpebral conjunctiva; or the membrane, being wiped dry, may be rapidly touched with the lunar caustic pencil. The latter application generally produces considerable pain and swelling of the lids, which subside under the use of cold wet compresses. Strong red precipitate salve is also a valuable application in granular conjunctiva.

6. None of these strong applications is to be used, if the cornea is affected with ulceration. In this case, the solution of nitrate of silver should be omitted, and the eye brought under the influence of belladonna, by painting the lids with the moistened extract. We may further the same object, by infusing 1 drachm of the extract of belladonna, or dissolving 2 grains of the sulphate of atropia, in every 8 ounces of the corrosive sublimate collyrium. It is not for the mere dilatation of the pupil that the belladonna or atropia is to be used, but to obtain the influence of this anodyne over the ulcerated cornea. Much experience has convinced me of its efficacy, in inducing a healing action in the cornea when affected with ulceration. Many eyes, which seemed, from the extent and depth of the ulcers present, to be doomed to destruction, have to all appearance been saved by its careful employment. Even in cases of perforated cornea,

I have seen the ulcer begin to fill up, and ultimately heal, without any adhesion of the iris, under the influence of belladonna.

7. A remedy of considerable service in this disease is the application of blisters behind the ears, or to the back of the head. A bit of candlewick, covered with cantharides plaister, and laid into the angle between the head and the external ear, is a convenient mode of breaking the skin; and by continuing this application either constantly, or several hours daily, a continued discharge will be procured. As soon as there is a discharge of matter from the blistered parts, we perceive an amendment in the state of the eyes. If, however, the ears are allowed to get well, we often observe a renewal of the inflammation, and a more copious flow of matter; but the symptoms again subside if the blisters are re-applied.

8. A dose of castor oil occasionally will be found useful.

9. Small doses of calomel are highly beneficial. From half a grain to a grain daily will be sufficient. Besides acting favourably on the conjunctiva, this remedy is likely to counteract the tendency to capsular cataract.

10. In threatened disorganization of the cornea, Mr. Saunders strongly recommended the extract of cinchona. The sulphate of quina answers better, and is more easily administered. From half a grain to a grain may be given thrice daily.

11. The relaxed conjunctiva, after the purulent discharge has entirely subsided, may be advantageously touched, once a day, with vinum opii. I have sometimes treated cases with the vinum opii throughout, but I consider this remedy as more applicable for the chronic stage of the complaint than for the acute. It serves to clear the cornea from the opacities so apt to be produced by this disease.

12. The child should be nourished by the breast alone. Giving it food often seems to keep up the disease. The mother or nurse's diet should be carefully regulated. During the acute stage of the ophthalmia, she should take little or no animal food, and should taste neither wine, spirits, nor ale. After the acute stage is over, should the conjunctiva continue relaxed, tincture of iron may be given to the nurse with advantage to the child.

In several instances, I have known ophthalmia neonatorum attack one child after another of the same parents. Such cases I suspect to be generally leucorrhœal.

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[1] To ascertain whether the purulent ophthalmia of infants is caused by a discharge from the genitals of the mother, affecting the eyes of the child during birth, Dr. Cederschjöld had the question put to every woman delivered during the year 1832, in the general lying-in hospital of Stockholm, whether or not she had such a discharge. Three hundred and sixty women were delivered; and, subtracting those who bore dead children, or whose children died a few days after birth, there remained 328. Of these, 137 had a discharge from the genitals, and 181 had not. Thirty infants had purulent ophthalmia; namely, 20 whose mothers had a discharge, and 10 whose mothers had none. Hence it appears that discharges from the genitals are extremely common among pregnant women, that women may be afflicted with them without giving their offspring ophthalmia purulenta, and that children may have the disease, though the mothers have no discharge; a proof that the malady may arise from other causes. But when we consider that of the children born of mothers affected with a discharge, 20 in 137, or about 1 in 7, suffered from the ophthalmia, while only 10 in 181, or about 1 in 18, of those whose mothers were unaffected, had the ophthalmia; and that, therefore, the proportion of the former was nearly three

times as great as that of the latter, we may assume that a discharge from the genitals of the mother, though not the sole cause of this disease, is a very frequent one. Medical Gazette; Vol. xxvii. p. 382; London, 1840.

Dr. Tyler Smith is of opinion that it is the acid or epithelial secretion of the vagina in leucorrhœa, and not puriform matter, which is the cause of ophthalmia neonatorum. Lancet, August 20. 1853, p. 158.

[2] I think there is reason to believe that gonorrhœa in either parent, or in both, may affect the offspring in various ways; for example, with malformations, as coloboma palpebræ, microphthalmos, &c. It has often struck me, that gonorrhœa in the parents may perhaps so affect the child *in utero*, that it is born with a predisposition to this ophthalmia. On one occasion I met with the eyes in the state of microphthalmos, and affected with gonorrhœal ophthalmia neonatorum. As the conjunctival folds were much enlarged before I saw the child, the case puzzled me a good deal. I saw what I thought was part only of the cornea tolerably clear, till the swelling of the conjunctiva fell, when the real nature of the case appeared. Gonorrhœa had existed in both parents.

[3] Archives Générales de Médecine, 4e Série; Tome i. p. 397; Tome ii. p. 9; Paris, 1843.

[4] Gazette Médicale de Paris, Janvier 24. 1852, p. 52.

[5] A similar case is related by Jüngken in his work Ueber die Augenkrankheit welche in der belgischen Armee herrscht; p. 8; Berlin, 1834.

[6] M. Chassaignac announced, some years ago, that the conjunctiva was covered in ophthalmia neonatorum by a pseudo-membrane, and that a great improvement in the treatment consisted in the employment of a cold water douche to the eyes. There is some reason to suspect, that what he considered a false membrane was the epithelium, so thickened and changed by the action of the douche, that it could be removed with the forceps. See Annales d'Oculistique; Tome xviii. pp. 138, 140, 273, 279; Bruxelles, 1847.

SECTION IX. — GONORRHŒAL OPHTHALMIA.

Syn.—Conjunctivitis puro-mucosa gonorrhoïca. Gonorrhœa oculi. Der Augentripper, *Ger.*

Fig. Dalrymple, Pl. X. *figs.* 3—6.

Different views have been entertained of the purulent inflammation of the conjunctiva, which is frequently found to attend, or succeed to gonorrhœa. 1st. This ophthalmia has been ascribed to inoculation with matter from the urethra; 2ndly. It has been supposed to be metastatic; and 3dly. It has been considered, at least in certain cases, as an effect owing to irritation merely, without either inoculation or metastasis. It is quite possible that there may be three such varieties of this ophthalmia. The existence of the first I consider beyond all doubt; but the second and third are somewhat problematical.

Some, while they have admitted that facts fully demonstrate that gonorrhœal ophthalmia occasionally owes its origin to inoculation, have expressed their surprise that it is not more frequently produced in this way, considering how common gonorrhœa is, and how careless many of those of the lower ranks are of cleanliness. We should expect, say they, the finger to be in many more cases the conveyer of the matter of the gonorrhœa to the conjunctiva, than it actually appears to be. The instinctive closure of the eyelids when the finger approaches the eye, making it actually difficult for a person to touch his own conjunctiva, unless with one finger he draws down the lower lid, and intentionally applies another finger to the eye, will serve in some measure to explain the rarity of this kind of inoculation.

Women are much less frequently the subjects of gonorrhœal ophthalmia than men.

In general, it is only one eye which is affected with this disease. Whenever we see one eye affected with severe puro-mucous inflammation, the lids much swollen, and of a livid colour, and the discharge copious, without any affection of the other eye, we may suspect the case to be gonorrhœal. Dr. Vetch, speaking of the Egyptian ophthalmia, says, "There is not one case in a thousand in which one eye only becomes affected."[1]

§ 1. *Gonorrhœal Ophthalmia from Inoculation.*

Case 268.—A patient was brought to me from the country by a gentleman under whose care he was, and who had formerly been one of my pupils. The left eye was violently inflamed and chemosed, the chemosis of a pale red colour, the conjunctiva discharging a large quantity of purulent fluid, the lower lid greatly everted, and the cornea, from lymph, and probably pus, effused between its lamellæ, totally opaque. The patient was affected with gonorrhœa, and, 13 days before I saw him, while engaged in removing the discharge from the urethra, a drop of the gonorrhœal matter was by mischance thrown fairly in upon his left eye, and excited the severe puro-mucous ophthalmia under which he was labouring. The gonorrhœa still continued when I saw him. The inflammation of the eye subsided under appropriate means, the cornea cleared to a degree far beyond my expectations, and a considerable share of vision was preserved. The right eye was not at all affected.

Case 269.—In a patient who came under my care 25th April, 1851, a drop of urine only, as he thought, had been projected into the right eye. He had had gonorrhœa, but it seemed to have ceased before the accident happened, four or five days after which he felt as if a mote had got into the eye. This was followed by violent purulent ophthalmia. The eye was saved.

Case 270.—Mr. Allan relates the following interesting case of contagious gonorrhœal ophthalmia:—"I was consulted," says he, "by a young gentleman of 17 years of age, on account of a gonorrhœa recently contracted, but by no means severe. In a few days after his application to me, the eyes became violently and suddenly inflamed, the eyelids much tumefied, and there took place a profuse discharge, similar to that of gonorrhœa, excoriating the cheeks, and accompanied by great pain, considerable fever, and general restlessness; the discharge from the urethra did not at once disappear, notwithstanding the violence of the ophthalmia. In a few days, his younger brother, a boy of 14 years of age, who never had been exposed to any venereal complaint contracted by sexual intercourse, and who slept in the same room, was similarly affected; and the disease in both eyes was equally severe as in those of the elder brother. I called Dr. Monro and Mr. J. Bell into attendance; but notwithstanding every means that could be devised, the elder brother lost the sight of both his eyes, and the younger brother of one eye. If it be said," adds Mr. Allan, "that in the elder brother the ophthalmia might arise from a consentaneous connection or sympathy betwixt the urethra and the conjunctiva, and not from the direct application of the virus, still this explanation will not at all apply to the younger brother, who had no gonorrhœa, but who must have contracted the disease from actual contact; as by using the same towel or wash-hand basin with his brother, wiping his face with the same handkerchief, or in some less obvious manner, and in whom it was equally severe."[2]

Case 271.—Astruc relates, that a young man had been in the habit of bathing his eyes every morning with his urine while it was yet warm, in order to strengthen his sight. Although he had contracted a gonorrhœa, he did not abstain from this custom, apprehending no harm from it; but the urine partaking of the infectious matter, quickly communicated the same disease to the tunica conjunctiva of the eye and eyelids. The consequence was a severe ophthalmia, attended with an acrid and involuntary discharge of tears and purulent matter, but which yielded to the same remedies which removed the gonorrhœa.[3]

Case 272.—A healthy young woman happened to wash her eyes with some sugar of lead water and a sponge, which had previously been used by a young man affected with gonorrhœa; the consequence was, that she immediately contracted a severe ophthalmia, which rapidly destroyed one eye, and brought on swelling of the lymphatic glands about the neck, for which she underwent a course of mercury.[4]

Case 273.—I saw a mother infected in the right eye with gonorrhœal ophthalmia, from the left eye of her son, who was similarly affected. He was labouring under preputial gonorrhœa, without being able to tell how he had got it. Both the inflamed eyes were lost.

So similar is the discharge from the eye in gonorrhœal and in Egyptian ophthalmia, to that which runs from the urethra in gonorrhœa, that some have gone the length of concluding that gonorrhœa has been originally an inoculation of the urethra by the matter derived from the eye in Egyptian ophthalmia; while others are of opinion that this last disease is nothing else than the effects of an inoculation of the conjunctiva with matter from the urethra in gonorrhœa. Both parties have referred to experiments in favour of their own opinion. Little can be drawn from negative experiments on this subject. It is demonstrated beyond all doubt that the matter from the urethra in gonorrhœa, applied to the conjunctiva, excites a severe puro-mucous ophthalmia, and a similar inflammation of the urethra has unquestionably been brought on by inoculation with the matter coming from the conjunctiva in the Egyptian ophthalmia; but experiments of this kind have also sometimes failed, and from such failures conclusions have been drawn that are altogether unwarrantable. For example, Dr. Vetch tells us that, in a soldier in a very advanced stage of the Egyptian ophthalmia, he attempted to divert the disease from the eyes to the urethra, by applying some of the matter taken from the eyes to the orifice of the urethra. No effect followed this trial. It was repeated in some other patients, all labouring under the most virulent state of the Egyptian disease; and in all, the application was perfectly innocuous. But, in another case, where the matter was taken from the eye of one man labouring under purulent ophthalmia, and applied to the urethra of another, the purulent inflammation commenced in 36 hours afterwards, and became a very severe attack of gonorrhœa. From the result of these experiments, Dr. Vetch, while he admits that gonorrhœal matter taken from one person and applied to the conjunctiva of another, will excite a highly purulent ophthalmia, regards himself justified in no longer admitting the possibility of infection being conveyed to the eyes from the gonorrhœal discharge of the same person. He adds that the impossibility of this effect was rendered decisive by an hospital-assistant, who, with more faith than prudence, conveyed the matter of a gonorrhœa to his eyes without any affection of the conjunctiva being the consequence.[5] It is remarkable, that Dr. Guillié has fallen into the same error of reasoning as Dr. Vetch, only that his negative experiments have led him to the very opposite conclusion. He applied the matter taken from the conjunctiva of one patient, to the urethra of another; no effect followed, and hence he concludes that the notion of some, regarding the propagation of puro-mucous inflammation from one mucous membrane to another in different individuals, is unfounded.[6]

Case 268 would have been sufficiently convincing to me of the reality of gonorrhœal ophthalmia by inoculation, had I entertained any doubt on the subject. The patient had a profuse gonorrhœa, but his eyes were perfectly well; shaking away the discharge from the penis, and stooping at the time, a drop went fairly in on the left eye; violent inflammation immediately set in, was all along confined to the eye which had been inoculated, and produced the results already stated, while the gonorrhœa continued to run its course.

Diagnosis. — There are no marks which can be absolutely depended on, by which to distinguish gonorrhœal ophthalmia, produced by inoculation, from the Egyptian or contagious ophthalmia. The symptoms of the former are not less rapid and severe than those of the latter; and the danger of losing the eye, by destruction of the cornea, greater perhaps than in any other ophthalmia. There is a great degree of chemosis, and a profuse discharge of matter, varying in colour, like the discharge in gonorrhœa. The external surface of the lids is perhaps not so much swollen, nor of so dark a red colour, as in the Egyptian ophthalmia. In the early stage, it will also be observed, that in the latter disease the inflammation commences on the inside of the lids; whereas in gonorrhœal ophthalmia, it attacks the conjunctiva more generally. The history of the two diseases will perhaps afford the best ground for diagnosis.[7]

Prognosis.—In 48 hours, this disease may have proceeded so far that sight shall be irretrievably gone. Thus, out of 14 cases related by Mr. Lawrence[8], 9 having only one eye affected, and 5 both eyes, 6 of the former suffered total loss of vision of the eye affected, while 3 retained perfect sight, though one had anterior synechia, and another a leucoma. Of the other 5, who had both eyes affected, 4 lost each one eye, and saved one; the 5th losing both eyes.

Like gonorrhœa, this ophthalmia varies much in severity; and from differences of constitution and other causes its effects are very different in different individuals, some eyes resisting the tendency to disorganisation and getting well, others being rapidly destroyed. The previous habits of the patient, such as his addiction to the use of spirits, often diminish greatly the chance of recovery.

Symptoms.—The symptoms of gonorrhœal ophthalmia by inoculation bear so close a resemblance to those of the Egyptian ophthalmia, that it is unnecessary to detail them.

The chemosis and swelling of lids are often rather pale. The discharge from the eye is generally profuse and purulent.

The cornea is often destroyed by an ulcerated groove forming at its edge, where it is covered and pressed upon by the chemosed conjunctiva. This groove goes round a considerable portion of the edge of the cornea; and about the twelfth or fourteenth day of the disease is very apt to give way, allowing the iris to protrude in one or several points. The eye may be quite entire and clear to-day, and to-morrow we find the cornea burst, generally near its lower edge. This event is very apt to happen about midnight, and is attended by the sensation of something having given way in the eye. I have known this event to happen when the patient was straining at stool. After this happens, the cornea appears small and flat, its centre continues pretty clear for a while, but vision is lost. In other cases, I have seen ulceration spread over a great part of the surface of the cornea, without penetrating, at least for a time, through its whole thickness. The cornea seems, in this case, to melt, as it were, away; it becomes so thin as to bulge forwards, and some part of it may look clear, from being so much thinned. In a day or two it gives way, and the case ends in staphyloma. All this may happen without any great chemosis, and without any overlapping of the cornea by the conjunctiva.

Treatment.—This ought to be exactly the same as in the Egyptian ophthalmia. Rest is of great importance. The patient ought not to travel to and from an hospital, but should be admitted into the house. There should be an abstinence from all stimulants. Blood-letting, both general and local, by venesection, cupping, leeches, and scarifying the conjunctiva, should be promptly used, as delay for a day, or even for an hour, may prove fatal to the eye. The exhibition of purgatives, or emeto-purgatives, and diaphoretics, is to be had recourse to in the early stage. The discharge is to be frequently and carefully removed with the muriate of mercury collyrium, the conjunctiva is to be brushed repeatedly in the course of the day with the nitras argenti solution, and the lids are to be prevented from adhering by the use of the red precipitate salve. Belladonna is to be applied, even before any ulceration of the cornea makes its appearance. Counter-irritation ought to be employed from the very first, by means of sinapisms and blisters to the neck, between the shoulders, or behind the ears. If the pain of the eye be pulsative, or the circumorbital region affected with nocturnal paroxysms of pain, calomel and opium are to be given till the mouth is sore. Aloes and blue pill, given in combination, I have found useful, when it is desirable to act on the system by a mercurial, and at the same time to move the bowels. Warm fomentations, the vapour of laudanum, opiate friction of the head, and the like, will serve to moderate the pain; but our chief reliance must be placed on depletion, counter-irritation, sacrification, and smarting applications to the conjunctiva. Snipping out a fold of the chemosed membrane, so as to procure a considerable flow of blood, is highly serviceable.

Bleeding alone must not be depended on. "The inflammation produced," says Mr. Bacot, "in the few instances that have come under my observation, is of the most violent and intractable description, and has produced the total destruction of the organ of vision in the space of two or three days, notwithstanding the most vigorous employment of general and topical blood-letting, and other antiphlogistic means."[9] Neither are local stimulants to be trusted to alone; but a combination of antiphlogistics and astringents is at once to be employed.

The acetate of lead, and the sulphates of zinc and copper, at least in the early stage, will be found to aggravate the symptoms. These are the local remedies recommended by Mr. Allan; and the case already quoted, the publication of which does great credit to his candour, shows how little adapted these applications are to this disease.

§ 2. *Gonorrhœal Ophthalmia from Metastasis.*

Saint-Yves appears to have been the first to speak of gonorrhœal ophthalmia from metastasis. His account of it is very short. He describes the conjunctiva as becoming hard and fleshy, the disease having commenced by an abundant discharge of white or yellowish matter. He states that, in most cases, the ophthalmia began two days after the commencement of the gonorrhœa, the latter discharge having at that period suddenly ceased, and thus caused a metastasis to the eye. He recommends blood-letting from the first, mercury, purgatives, and the warm bath. As local applications, he advises brandy and water, and a decoction of rosemary, sage, hyssop, and roses in red wine.[10]

Succeeding writers have adopted Saint-Yves' views of the subject with too little hesitation, and appear not to have sufficiently investigated the probability of the ophthalmia arising rather from inoculation than from metastasis.

The causes of the suppression of the gonorrhœa, to which the rise of metastatic gonorrhœal ophthalmia is attributed, are exposure to cold, violent exertions of the body, the abuse of spirituous liquors, and the employment of astringent injections into the urethra.

The following may serve as a specimen of alleged metastatic gonorrhœal ophthamia.

Case 274.—A captain in the army, aged 29, was ordered to mount guard at court, in the month of January, when he had a violent gonorrhœa. The day was excessively cold, and he was forced by his duty to remain a long time exposed to the air during the day and night. Towards midnight he began to feel the most violent pain in both eyes at once, which very soon increased to such a degree that he could not endure any kind of light. Next day these symptoms were attended by a discharge of puriform matter from both eyes, and the albuginea appeared very much inflamed and swollen. A physician was sent for, unfortunately very ignorant, who ordered general remedies, as bleeding, purgatives, &c., with a fomentation of hemlock. The third day, on examining things more closely, the cornea was found completely opaque, and a hypopion formed; there appeared to be no ulceration. The hemlock was continued without any effect. Ten or twelve days after, the inflammation began to abate, and the discharge from the eyes stopped; but the cornea did not recover its transparency; on the contrary, it was extremely thickened, and the patient remained entirely blind for life.[11]

Treatment. The only point of treatment in cases of metastatic gonorrhœal ophthalmia, different from that which is followed when the disease is brought on by inoculation, is the attempt, so much recommended by some authors, to restore the suppressed discharge from the urethra. This is done by introducing a bougie into the urethra, covered with some of the purulent discharge from the eye, or with gonorrhœal matter from another subject. Even the simple introduction of a bougie might perhaps produce the effect desired; for any stimulus applied to the lining membrane of the urethra, of sufficient activity to determine an irritation and an abundant secretion of mucus, may produce a running similar to gonorrhœa. If this plan is adopted, the bougie must be retained in the urethra for several hours at a time, till the desired effect is produced.

§ 3. *Gonorrhœal Ophthalmia without Inoculation or Metastasis.*

Various authors have related cases of puro-mucous ophthalmia occurring in individuals, who, either at the time when the ophthalmia attacked them, or a short time before its attack, had been affected with gonorrhœa. An alternation also has been observed by these authors between the two diseases; that is to say, when the gonorrhœa came, the ophthalmia went, and *vice versâ*. The conclusion drawn from such cases has been, that a relation exists between the two diseases, and that they are convertible the one into the other without being metastatic. None of the authors who have described the cases to which I now refer, have explicitly attributed the production of the ophthalmia in question to the influence of nervous sympathy; and yet, if we throw inoculation and metastasis aside, there appears to be no other means by which the diseases of remote organs can be connected, except by nervous communication. The facts recorded upon the subject are valuable, whatever opinion we may form of the reasonings of those by whom they are narrated.

Case 275.—Swediaur states that a young man in London came to consult him for an ophthalmia. After he had tried the best remedies, internal and external, that he knew for an ophthalmia, without effect, the patient left him. He heard nothing more of him for two months, when he returned to him with gonorrhœa. During his absence he consulted several practitioners on account of his ophthalmia, but with no better success than before; but having caught a gonorrhœa eight days before returning to Swediaur, he began to feel his eyes better from the third day of the discharge. The ophthalmia continued to diminish from day to day, and he was quite cured of it. Swediaur asked him if he ever had gonorrhœa previously to the attack of ophthalmia. He said he had it some time before he came to consult him first about his eyes; that he suffered much, and for a long time, with it, but that at last the discharge disappeared; and that he had not mentioned it, as he had not supposed there was any connection between the gonorrhœa and the complaint in his eyes, which had come on several weeks after.

Swediaur tells us, that this fact was too striking a lesson for him ever to forget it; and that he never afterwards failed, in similar cases of ophthalmia, to ask the patient if he had not previously had a gonorrhœa, and if it was properly treated and cured. He describes the ophthalmia in cases of this sort, as a chronic inflammation of the eyes, and especially of the eyelids, attended very often with little ulcers of the sebaceous glands, and with an oozing of thick yellowish matter. In all such cases, especially when the patients told him that they had tried many internal and external remedies for the ophthalmia, he did not hesitate to advise the use of bougies for a couple of hours a-day, as the surest and speediest way of curing the ophthalmia; and he tells us, that he had the satisfaction of seeing most of such cases cured, even without any other external application.[12]

Case 276.—A sailor used all his influence to get appointed to the command of a frigate. He waited on the Admiralty frequently, and was promised a ship; and in the mean time went into Scotland grouse-shooting. Whilst there, he received instructions from the Admiralty to take the command of a frigate then lying at Falmouth; he lost no time in setting out, and placed himself in the mail-coach for London. Just before he left Edinburgh, he caught a gonorrhœa. On the journey his eyes became inflamed; and when he reached London, he had a violent ophthalmia, with purulent discharge. He was in a dreadful state both of body and mind, could not bear the light, and had great pain in the eyes.

Mr. Abernethy, whom he consulted, asked him if ever he had gonorrhœa or inflamed eyes before. He answered, that he had had both the one and the other; and that when the discharge from his urethra was stopped, the eyes became bad, and when his eyes got well, the gonorrhœa returned.

Mr. A. directed him to remain quiet in a darkened room, to wash his eyes frequently, in the course of the day, with tepid poppy water, to take five grains of the blue pill every night, with some castor oil to open the bowels, and to keep himself upon a strictly spare diet. During the first six days he mended very slowly and not considerably. But on the 7th day, when Mr. A. called, he found the patient sitting up in his room, the window uncovered, and his eyes almost well. Mr. A. expressed his surprise, and asked how this change had so suddenly happened, to which he answered that he had had a number of very copious fetid stools in the night, and that his complaints had left him. It seemed to be a sort of critical secretion from the liver and the whole of the alimentary canal, followed by an almost immediate removal of the irritable inflammation of the eyes.

Mr. Abernethy, in his surgical lectures, spoke of such cases as the above as examples of an *irritable ophthalmia,* attendant on gonorrhœa, very different from the purulent ophthalmia excited by touching the eye with the matter from the urethra, and in fact a constitutional malady. He stated that he had seen many cases of both diseases; that he had known many people who were liable to rheumatism of the joints, to puriform discharges from the urethra, and to this irritable ophthalmia; and that these diseases used to alternate the one with the other. When the rheumatism ceased, the discharge returned from the urethra, and when the discharge from the urethra ceased, the affection of the eye returned, and thus one disease supervened upon another. He stated that if the surgeon is frightened at this irritable ophthalmia, supposing it to be one of the dreadful cases in which the eye is clapped, and proceeds to bleed and purge the patient severely, he will only make the matter worse. Moderate bleeding, he said, may be useful; but the chief object is to attend to the patient's general health. No means are so likely to be useful as setting the digestive organs to rights, and sending the patient to the country.[13]

The two cases above quoted, with the remarks subjoined to them by their narrators, will serve in some measure to show the diversity which exists in the opinions entertained regarding the ophthalmiæ which in some individuals are found to attend gonorrhœa, or to alternate with this disease. It is quite evident that the ophthalmiæ which have been observed to do so, are far from being uniform. That observed by Swediaur appears to have been little more than ophthalmia tarsi; that which occurred in Mr. Abernethy's case bears a strong resemblance to catarrhal ophthalmia, and probably was nothing more. As it is acknowledged that in neither of these cases was there either inoculation or metastasis, it may fairly be doubted whether there was any connection between the disease of the urethra and that of the eye, farther than that they occurred in the same individuals, while the occurrence of both might be attributed to a susceptibility for disease arising from peculiar or debilitated constitutions.

Swediaur's hint to employ the bougie, in cases of ophthalmia alternating with gonorrhœa, may probably be found of use; it is evident, however, that this remedy cannot be trusted to alone, but that the ophthalmia must be treated according to the particular symptoms it presents, not according to the conjectural notions entertained regarding its origin.

In a subsequent Section, I shall give some account of an internal ophthalmia, which depends upon gonorrhœa, under the head of *Gonorrhœal Iritis.*

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[1] Practical Treatise on the Diseases of the Eye, p. 195; London, 1820.

[2] System of Pathological and Operative Surgery; Vol. i. p. 153; Edinburgh, 1819.

[3] De Morbis Venereis, p. 192; Lutetiæ Parisiorum, 1736.

[4] Chirurgie Clinique de Montpellier, par le Professeur Delpech; Tome i. p. 318; Montpellier, 1823.

[5] Op. cit. p. 242.

[6] Bibliothèque Ophtalmologique; Tome i. p. 83; Paris, 1820.

[7] Dr. Hairion insists on the existence of a pre-auricular bubo as diagnostic of gonorrhœal ophthalmia; but this symptom occasionally occurs in other ophthalmiæ, and is not constant in the gonorrhœal. Annales d'Oculistique; Tome xv. p. 159; Bruxelles, 1846. On the diagnosis of gonorrhœal and Egyptian ophthalmia, see Henrotay, Annales d'Oculistique; Tome xxiv. pp. 179, 229, 254; Bruxelles, 1850.

[8] Treatise on the Venereal Diseases of the Eye, p. 25; London, 1830.

[9] Observations on Syphilis, p. 46; London, 1821.

[10] Nouveau Traité des Maladies des Yeux, pp. 187, 209; Paris, 1722.

[11] Swediaur's Treatise upon the Symptoms, Consequences, Nature, and Treatment of Venereal or Syphilitic Diseases; translated from the French; Vol. i. p. 245; London, 1819.

[12] Ibid. p. 247.

[13] Lectures, in the Lancet; Vol. vii. p. 5; London, 1825.

SECTION X.—APHTHOUS OPHTHALMIA.

Syn. — Conjunctivitis aphthosa. Pustular ophthalmia.

Fig. Dalrymple, Pl. XIII. *figs.* 4, 5, 6. Sichel, Pl. V. *fig.* 2.

Having considered the blenorrhœal affections of the conjunctiva, we have now to turn our attention to some of its cutaneous or eruptive diseases. The chief of these are aphthous and phlyctenular ophthalmiæ; to which may be added, the inflammation of the conjunctiva in measles, scarlatina, and erysipelas. The conjunctiva is apt to suffer in all cutaneous eruptions. It is inflamed during small-pox. I have seen it evidently affected in herpes, lepra, and elephantiasis. I was called into consultation with Dr. Lawrie, to see a child in whom pompholyx began on one eyelid, four days after birth, and spread over most of the body, ending with inflammation of the conjunctiva, and an ulcer on the cornea, of the eye first affected. A patient called on me with a syphilitic tubercular eruption on his face and body; a tubercle occupied the sclerotic conjunctiva. It died away with the other tubercles under the action of mercury.[1]

The aphthous variety of eruptive conjunctivitis is distinguished from the phlyctenular in the following respects:—

1. Instead of minute elevated points on the cornea, or close to its edge, we observe, in the present disease, one or more pretty large aphthæ, which bursting, form broad elevated ulcers, generally at the distance of half a line or a line from the edge of the cornea. Although this disease is often called *pustular ophthalmia*, the eruption which takes place on the conjunctiva is not properly one of pustules. No purulent matter is discharged when they burst, but only a watery fluid, so that they are rather aphthæ than pustules.

2. The redness, instead of being fascicular, is rather reticular. It radiates commonly round the aphthæ, but is sometimes pretty generally spread over the conjunctiva, and is occasionally attended with small ecchymoses under that membrane.

3. The aphthous ophthalmia is often combined with catarrhal conjunctivitis.

4. There is much less intolerance of light in aphthous, than in phlyctenular ophthalmia, often none, and never the continued blepharospasm so characteristic of the latter disease.

5. We never meet with aphthous ophthalmia in teething children. The common subjects are children of 10 or 12 years of age, and not unfrequently young adults.

6. The aphthous ophthalmia is less dangerous and more tractable than the phlyctenular, into which, or into the scrofulo-catarrhal, it sometimes has a tendency to pass.

Treatment.—The present disease generally yields readily to a few simple remedies.

1. The eye is to be touched once a-day with a solution of from 4 to 10 grains of nitrate of silver in an ounce of distilled water, and bathed thrice a-day with a solution of 1 grain of muriate of mercury and 6 grains of muriate of ammonia in 8 ounces of water.

2. After a smart dose of calomel and jalap, the patient ought to take from 10 to 20 grains of precipitated carbonate of iron thrice a-day.

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[1] See case by Smee, Medical Gazette; Vol. xxxv. p. 347; London, 1844.

SECTION XI.—PHLYCTENULAR OPHTHALMIA.

Syn.—Conjunctivitis phlyctenulosa. Scrofulous ophthalmia. Strumous ophthalmia. Photophobia infantum scrofulsa. Exanthematous ophthalmia; *Wardrop.* Remittent ophthalmia; *Hancock.*

Fig. Wardrop, Pl. I. *figs.* 2, 3. Pl. II. *figs.* 1, 2. Pl. V. *fig.* 1. Pl. VII. *fig.* 3. Pl. X. *fig.* 1. Ammon, Thl. I. Tab. IV. *fig.* 2. Dalrymple, Pl. VIII. Pl. XIII. *figs.* 2, 3. Pl. XIV. *figs.* 1, 2, 3. Sichel, Pl. V. *fig.* 1. Pl. IX. *figs.* 3, 5, 6.

Phlyctenular ophthalmia is the disease most commonly known by the name of *scrofulous ophthalmia.* It is distinguished from all the other inflammations of the eye by symptoms so very striking, that any one who has seen the disease a few times cannot mistake it. Slight redness, great intolerance of light, phlyctenulæ at the edge or on the surface of the cornea, and ulcers and specks resulting from these phlyctenulæ, are the symptoms which characterize this ophthalmia; a disease to which children are so liable, that out of the 100 cases of inflammation of the eyes in young subjects, 90 are of this kind. This ophthalmia is very often the first manifestation of a scrofulous constitution; and, neglected or mistreated, frequently becomes the cause of permanently impaired vision, or even of entire loss of sight. It seldom attacks infants at the breast; from the time of weaning till about eight years of age, is the period of life during which it is most prevalent. It is rare indeed for adults to be affected with it, unless they have suffered from it at an early period of life. Sometimes only one eye is inflamed; at other times, both are affected from the first. Not unfrequently the disease passes from the one eye to the other. When both are inflamed at once, the one is generally much worse than the other.

Symptoms.—1. *Redness.* At the commencement of the disease, the redness of the conjunctiva is generally very slight. It often exists only on the inside of the lids. Sometimes a few scattered vessels are seen coursing through the conjunctiva towards the cornea; in other cases, no enlarged vessels are perceived, so that the disease in this incipient stage is distinguished more by intolerance of light than by any direct signs of inflammation. Perhaps three or four enlarged vessels are discovered, running from either angle towards the cornea, or over its edge, evidently superficial, or even rising above the level of the conjunctiva. Not unfrequently the inflamed vessels form a single considerable fasciculus (*fig.* 51. p. 434). Although in by far the greater number of cases the redness is scattered, it sometimes happens that it is pretty general over the conjunctiva, even from the first. As the disease advances, the redness becomes increased, and the sclerotica also appears somewhat injected.

2. *Phlyctenulæ — Ulcers — Protrusions — Specks.* This ophthalmia, like that considered in the last Section, is an eruptive disease. It affects the conjunctiva, not as a mucous membrane, but as a continuation of skin over the eye. One of its most remarkable symptoms is the existence of one or more phlyctenulæ, or small pimples, on the surface of the eyeball. In many instances, a single minute elevated point, of an opaque white colour, near the centre of the cornea, is all that is to be seen of this kind; in other cases, numerous phlyctenulæ are present, some on the cornea, and others just at its edge. This last is a very common situation for them. They vary in size according to the part in which they appear, being commonly smallest on the cornea.

The phlyctenulæ may be absorbed; and then, if situated on the cornea, they generally leave a small *albugo*, the effect of that effusion of coagulable lymph which surrounds every circumscribed abscess, but which will, in general, be totally removed by absorption in the course of time. Occasionally it happens that, after an albugo is removed by absorption, a transparent *dimple* is left in the cornea, which is long of filling up. In some cases, instead of disappearing, an albugo begins to grow, rising above the level of the cornea, and spreading over it in an irregular manner; red vessels of considerable size are seen running into it; and additional lymph being supplied to it, it forms what I call a *vascular speck*, which is a very tedious and troublesome symptom.

More frequently the phlyctenulæ suppurate, burst, and become ulcers, sometimes superficial and considerable in extent, often deep and funnel-shaped. This symptom, which is preceded by the appearance of additional red vessels running to the phlyctenula, is one of the most dangerous symptoms of the disease. Over the sclerotica, indeed, an ulcer, arising from the rupture of a phlyctenula, is of less consequence; but on the cornea, the transparent inlet of light, an ulcer of any description is an event exceedingly to be dreaded. It is very apt to disfigure the eye; and by the opaque cicatrice which it leaves behind, permanently to obstruct vision.

The formation of an ulcer, especially if it be situated on the cornea, always produces an increase of pain, greatly aggravated on any attempt to move the eye.

It but too often happens that an ulcer penetrates gradually through the whole thickness of the cornea, into the anterior chamber. In many cases, this serious event must be ascribed to neglect or mismanagement. Through the little fistulous opening of the cornea formed by the penetration of an ulcer, the aqueous humour is suddenly discharged, and a small portion of the iris protruding looks not unlike the head of a fly. Hence this symptom is termed *myocephalon.* This piece of the iris, unless drawn away from the cornea by belladonna, unites, by adhesive inflammation, to the opening through which it is prolapsed (*synechia anterior*), the ulcer around it gradually contracts and whitens at the edge, the protruded portion of iris disappears, the pupil is drawn to one side, and a white indelible cicatrice of the cornea partially or entirely prevents vision. (*Fig.* 53.) A cicatrice of the cornea is called *leucoma,* in contradistinction to *albugo;* the latter opacity being the result of exudation, not of ulceration. If the ulcer has extended deep into the substance of the cornea, and much more if it has penetrated through it completely, the leucoma which follows, being the result of the formation of fibrous substance unlike the natural tissue, remains for life, although in the progress of growth, and after a length of time, it may contract considerably. The cicatrice resulting from a superficial ulcer, may entirely disappear. Indeed, the cicatrice from a superficial ulcer is sometimes transparent from the first, forming a variety of *dimple* different from the one already noticed.

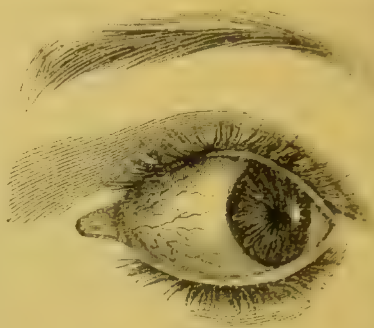

Fig. 53.

If several phlyctenulæ form on the cornea at the same time, it sometimes happens that they unite with one another before they burst, so that the purulent matter they contain is infiltrated between the lamellæ, and thus a kind of onyx is formed. At other times, onyx appears at the lower edge of the cornea, independently of the phlyctenulæ.

In some cases of ulcer of the cornea, the progress of the ulcer is unimpeded till the whole thickness of the cornea is penetrated, except the lining membrane, or posterior elastic lamina, which withstands for a time the ulcerative process, but being unable to support the pressure of the aqueous humour, is projected through the ulcer in the form of a small vesicle. This is what is called *hernia corneæ.* At last, this protrusion of the lining membrane gives way, the aqueous humour escapes, prolapsus of the iris follows, and a dense opaque cicatrice will be the result.

Where there has been an extensive prolapsus of the iris through an ulcer of the cornea, the cicatrice or pseudo-cornea which is formed over the protruded portion of iris, is sometimes unable to sustain the aqueous humour, and is pressed forwards so as to form a partial *staphyloma.*

3. *Pain—Intolerance of light—Blepharospasm—Epiphora.* The excessive intolerance of light, which in general attends phlyctenular ophthalmia, is one of its most characteristic and distressing symptoms. The child (for children are the usual subjects of the disease) is often quite unable to open the eyes in the ordinary light of day, or by any act of volition to expose them so as to permit a satisfactory examination of their state; all his attempts to look up are instantaneously

interrupted by spasmodic contraction of the eyelids; for days, weeks, or months, a child affected with this disease will lie on his face in bed; or, if forced out of bed, he will stand pressing his eyes against his arm, and no persuasion will bring him to lift up his head or look at the light. The intolerance of light is always most severe during the day. In the evening it often remits so much as to allow the patient to open his eyes, and enjoy vision to a considerable degree, for some hours.

It might perhaps be supposed that this excessive intolerance of light and spasmodic contraction of the orbicularis palpebrarum should attend only the worst cases, or where there is a great degree of inflammation. But it is not so. The mother, or the nurse taking up the child, lays it across her lap, while the surgeon, receiving the head firmly between his knees, and laying hold of the eyelids, without suffering the conjunctiva to become everted or protruded, raises the upper eyelid, so as to expose the sclerotica; the cornea is turned up out of view, and it sometimes requires considerable management to elevate the upper lid and depress the eyeball so as to expose the cornea completely. But still this may be done; and before any prognosis can be given, must be done. In many cases we are astonished, when we thus examine the eye, to find only a very insignificant degree of redness, scarcely more than we should find were we to examine a healthy eye in the same way, the cornea often perfectly transparent and entire, or perhaps presenting a single minute spot of opacity, with a few red vessels running over the sclerotica. The excessive intolerance of light in many cases constitutes the only symptom, which has led Benedict to treat of it[1] as a separate disease under the name of *photophobia infantum scrofulosa.*

This symptom is attended with epiphora, and often by violent fits of sneezing. Whenever the patient voluntarily attempts to open the eye, or whenever we forcibly expose it, a gush of tears succeeds; the eye is thereby reddened, the eyelids swell, and the cheek is apt to become chafed and excoriated. A pustular eruption rises upon the face from the irritation of the tears, and the cheek sometimes becomes exceedingly swollen, red, and painful from the same cause. This symptom is often aggravated by the improper use of poultices.

There does not appear to be in general any very great degree of absolute or inflammatory pain attendant on phlyctenular ophthalmia, except when the patient attempts to open the eye. If we let the child alone, he will lie all day in some dark corner of the room, without complaining much of pain. But so excessively disagreeable to him is the least access of light, that he will rather forego all his little amusements, both within and out of doors, than open his eyes. Moving the eyes to look at the light, or at any object, brings on a sensation as if they were full of sand, and sometimes causes a feeling of intolerable glare and dazzling. Pain during the night, however, is not an unfrequent symptom. It seems to occur even during sleep, for the child often awakes screaming with pain in the eyes. Commonly a great degree of itchiness of the eyes attends this disease, so that the patient rubs them much.

An anotomical fact, to which I have already (p. 85) had occasion to refer, may aid us in accounting for the extreme intolerance of light, spasmodic contraction of the eyelids, and epiphora which accompany scrofulous ophthalmia, even in cases where scarcely any redness is present; namely, that the lacrymal nerve, after supplying the lacrymal gland, goes to the conjunctiva and orbicularis palpebrarum, and may serve to establish a strong nervous sympathy between these parts. We see the same reflex action called forth when any minute particle of dust fixes on the inside of the upper eyelid. We have then the same intolerance of light, spasm of the orbicularis palpebrarum, and rush of tears, which we meet with in phlyctenular conjunctivitis, so that it would appear that this disease, even in its incipient stage, excites very much the same train of effects which follows the irritation produced by a particle of dust on the inside of the upper eyelid. It excites the sensitive nerve of the eye or fifth pair, whence arises a reflex action of the muscular nerve or portio dura.

The intolerance of light in this disease has, by one author[2], been regarded as depending on an affection of the retina, as being, in fact, a reflex action of the orbicularis palpebrarum, produced by the incidence of light upon the retina in an irritable state. This idea seems to derive some degree of support from the fact that, in the dusk, the patient is able to open his eyes, whereas, were this symptom dependent merely on the state of the conjunctiva, it should remain the same in obscure as in bright light, and be more marked perhaps in catarrhal ophthalmia than in phlyctenular. The evening remission is a peculiarity of the disease which we cannot completely explain.

4. *Ophthalmia tarsi — Iritis — Asthenopia — Amaurosis — Atrophia bulbi.* Other local symptoms, besides those already enumerated, are often present. Very frequently we find this disease combined with ophthalmia tarsi. In many cases we observe zonular inflammation of the sclerotica; and although iritis is a much more frequent attendant on corneitis than on phlyctenular ophthalmia, yet we occasionally find the pupil small, with a want of lustre or even slight discolouration of the iris, though generally without effusion or adhesion. Choroiditis is still more rarely associated with this disease. From neglect or mismanagement, however, it is sometimes allowed to end in internal scrofulous ophthalmia, characterized by nebulous capsule, contracted irregular pupil, unnatural hardness of the eyeball, and a more or less imperfect sensibility of the retina.

In one case which I saw, the intolerance of light and spasm of the lids had continued for more than a year. When at length they abated, which they did of themselves without the influence of medicine (the mother having neglected to attend at the Eye Infirmary), the child groped with its hands, as if blind, although it saw; so strongly confirmed was the habit of using the sense of touch in preference to that of sight.

In another case, on the photophobia subsiding, I discovered the child to be amaurotic, although, until seized with the ophthalmia, it had seen perfectly. Asthenopia and incomplete amaurosis are common sequelæ of scrofulous ophthalmia, and seem attributable to impeded nutrition, and change of texture, in the internal parts of the eye, arising partly from inflammatory action, and partly from the long-continued external pressure on the eyes, exercised by the patient in neglected cases.

Not unfrequently, the interruption to nutrition in long-continued phlyctenular ophthalmia, is such that the eyeball remains through life dwarfish or atrophic.

5. *Other scrofulous symptoms* may be detected in almost every case; as, eruptions about the head, sore ears, swelling of the upper lip, running from the nose, excoriation of the nostrils, enlarged lymphatic glands under the jaw, hyperostosis of the fingers, swollen joints, tabes mesenterica, &c. With some of these symptoms we often find the ophthalmia to alternate, being aggravated, for instance, when sore ears cease to run, and abating when they again begin to discharge. I have seen this ophthalmia repeatedly alternate with scrofulous swelling of the knee. The eruption on the scalp, which is generally observed along with this disease, is porriginous. Not unfrequently, an impetiginous eruption over the body is found to be present, especially in children who live much on milk.

6. *Dyspepsia, disordered bowels, and a tumid and hard abdomen,* commonly attend scrofulous ophthalmia. The appetite is variable; generally deficient, sometimes craving. The stomach and bowels appear to be loaded with morbid secretions. The evacuations are sometimes dark; often pale, of a grayish colour, or of the appearance of moist clay. The breath is fetid; the teeth rot away, from acidity in the stomach. The tumidness of the belly seems to be owing in part to muscular weakness.

7. Although the patients are often of a gross habit of body, this comes to be attended by considerable *general debility,* especially in cases of long continuance. The skin becomes loose and flabby, and sometimes a great degree of emaciation is present. This state of the body often precedes the occurrence of the ophthalmia, and is always aggravated when the eyes become affected. The patient is hot and restless in the early part of the night, and sweats profusely towards morning. A great degree of fretfulness is produced by the disease, and prolongs its continuance.

Remote or predisposing causes.—1. *The scrofulous constitution* may be regarded as the chief remote or predisposing cause of this ophthalmia..

2. *Food—Air—Exercise—Clothing.* While we regard the scrofulous constitution as a principal predisposing cause of this ophthalmia, we must not omit to mention that other remote causes powerfully operate in its production; namely, improper diet, want of air and exercise, and insufficient clothing. It is from the operation of these causes that this ophthalmia and other scrofulous diseases are so frequent in large and crowded towns; and prevail so abundantly among the children of the poor, who live in narrow streets and alleys, breathing an impure atmosphere, confined to a scanty and unnutritious diet, regardless of cleanliness, and ill-protected from changes of weather. This ophthalmia may be regarded as, in a great measure, a secondary affection, originating in a peculiar condition of the general system, arising from impaired nutrition. Imperfect lactation during infancy,

followed, after the period of weaning, by an irregular or improper diet, gives rise to an impoverished condition of the blood; and this, aided by the other detrimental causes I have enumerated, shows its effects in various local diseases, one of the most frequent of which is the ophthalmia in question. The confinement of children to filthy, small, ill-aired nurseries is also a cause, scarcely less prolific, of scrofulous ophthalmia.

3. *Climate.* Our variable climate is a powerful promoter of this disease, while in the south of Europe, in the inland parts of Italy, for instance, it is rare, even among the poorest of the people, whose food is the least digestible and least nourishing.[3] We see the effects of climate on this ophthalmia, in the rapid changes which it undergoes when the weather becomes either suddenly cold and wet, or dry and warm. All the symptoms are greatly aggravated by the former, and as remarkably relieved by the latter. New attacks, both in those who have, and those who have not previously suffered from this disease, are most prevalent during north-easterly winds.

Exciting Causes.—1. One of the most frequent exciting causes is *exposure to cold,* and especially to weather at once wet and cold. Standing in a draught of cold air, so as to bring on a chill, we often find to produce a relapse in patients who were previously recovering.

2. *Measles, scarlet-fever,* and *small-pox* rouse into activity the scrofulous diathesis. These diseases themselves affect the eyes, and leave them tender and apt to fall into this ophthalmia.

3. *Catarrhal ophthalmia,* brought on in the common way, is extremely apt to degenerate, in scrofulous children, into the phlyctenular.

4. *Excessive use of the eyes* on minute objects, and especially by candle light, is often the exciting cause of scrofulous ophthalmia.

5. *Teething* is a frequent exciting cause. It would appear that from the communications existing between the second and third divisions of the fifth nerve and the lacrymal nerve, teething excites lacrymation, blepharospasm, and ultimately phlyctenular conjunctivitis.

6. *Injuries,* as those produced by particles of dust lodging in the folds of the conjunctiva, scratches of the eyes, slight blows, and the like, are often the occasional causes of phlyctenular ophthalmia.

Prognosis.—It is necessary to give a very cautious prognosis in this disease. Much depends on whether the friends of the patient are able and willing to pursue the treatment methodically, not only till the cure seems complete, but for a considerable length of time after, and till the constitutional health is established. No disease is so apt to relapse; the parents should be made aware of this, and directed to make instant application whenever they observe a recurrence of any of the symptoms.

When ulcers are present on the cornea, opacities must necessarily follow. These will prove more or less obstinate according to the depth of the previous ulceration, and will impede vision in proportion as they extend more or less over the pupil. Perforating ulcer, followed by protrusion of the iris, leaves almost uniformly a dense leucoma, with deformed pupil.

I have already mentioned the danger of iritis, retinitis, &c. supervening to phlyctenular ophthalmia. I may add, that in after-life many become amaurotic, with hardness of the eye and glaucoma, who in youth suffered from this disease. Eyes which have been long and severely affected with scrofulous inflammation, are never so good afterwards, and are more apt than others to become amaurotic, if they are much fatigued, or if other detrimental causes come into operation, such as a sedentary occupation, the use of tobacco, alcohol, &c.

Treatment.—We are obliged to speak of the treatment of phlyctenular ophthalmia in very different language from what we employ in advising remedies for almost any other inflammatory disease of the eye. In other ophthalmiæ, we say, Follow this plan of treatment which we recommend, and the disease will speedily be overcome. We speak thus of the catarrhal ophthalmia, and of several others; but we cannot speak in this way of the phlyctenular. We are forced to confess that, in many cases, this ophthalmia proves rebellious. If it be asked, Why it does not yield, even to the best-directed treatment? we answer this question by proposing another; namely, Why does an inflamed gland of the neck in a scrofulous individual prove so troublesome, going on to suppurate in spite of every means adopted to promote resolution, and after it has suppurated and burst, continuing to discharge for years? The *scrofulous constitution* is the cause of the extreme tediousness of this ophthalmia, as well as of the frequently intractable nature of other scrofulous affections; and till we discover means for curing scrofula, this ophthalmia will continue occasionally to mock by its stubbornness, even the best and most carefully pursued plan of cure.

Is it incurable, then? Are we to do nothing for it, but shake our heads, and leave the eyes to be destroyed? Not at all. Much may be done to relieve this disease. Although it is difficult to cure it thoroughly, especially when the patient continues exposed to the influence of the same causes which originally produced it, yet it is rare indeed that medical treatment does not greatly moderate the symptoms, and avert those changes in the transparent front of the eye, which in neglected cases so often cause loss of sight. But when the practitioner does meet with cases, as sometimes he must do, which receive no benefit for weeks or months, but perhaps rather get worse, notwithstanding all that is done for them, he must not blame himself too much, but reflect on the intractable diathesis with which, in such cases, he is called to contend. This he cannot change, and often fails even in the smallest degree to ameliorate.

In the treatment of this disease, it is necessary constantly to bear in mind that it depends on a constitutional cause. To endeavour to relieve the local affection, therefore, will not be sufficient; we must improve the general health.

General Remedies.—1. *Bleeding.* General blood-letting is rarely required; scarcely ever indeed, except in adults or adolescents affected with supra-orbital pain: nor need local bleeding be had recourse to, unless considerable febrile excitement, as well as local distress, be present. When the inflammatory action runs higher than ordinary, or where it is suddenly or violently augmented by the formation of ulcers on the cornea, it is proper to moderate the impetus of the blood, by the application of leeches in the neighbourhood of the eye, over the nasal vein, to the temple, or behind the ear. If the constitution is not as yet impaired by long continuance of the disease and the employment of many debilitating remedies, repeated recourse must be had to the use of leeches, so long as the redness of the conjunctiva is considerable, and the intolerance of light acute. It must be kept in mind, however, that not unfrequently we may dispense with bleeding entirely, by putting the patient under the influence of tartar emetic, by the administration of the sulphate of quina, and by various other means, general and local; and that by depletion alone no case of this disease can ever be cured. On the contrary, repeated bleedings, without the use of other remedies, reduce too much the general strength, and render the eye more susceptible of destructive changes.

2. *Emetics and nauseants.* One of the most powerful and successful methods of treating phlyctenular ophthalmia is by means of tartar emetic, either in such doses as to produce vomiting; in smaller quantities frequently repeated, so as to excite nausea; or combined with a purgative. There is, perhaps, no remedy in the whole materia medica which possesses equal powers of a *sedative* kind in this disease. It reduces very considerably the necessity of general and local blood-letting.

I generally commence the treatment with an emetic, either of ipecacuan or tartar emetic, and uniformly with good effects. Four grains of the latter being dissolved in 6 ounces of water, a table-spoonful is given every five minutes till free vomiting is produced.

In cases where there is considerable quickness of pulse and heat of skin, I frequently put the patient on a course of nauseants, or of emeto-cathartics. For instance; to an adult a mixture may be given of from 1 to 4 grains of tartar emetic, with from 1 to 2 ounces of sulphate of magnesia, dissolved in a pound of water. Of this solution 2 or 3 table-spoonfuls may be taken every half-hour till vomiting is excited; after which, the dose is to be repeated at intervals of three, four, or six hours, as circumstances may require. This is the method to be followed in acute cases. In chronic cases, the nauseant may be exhibited at longer intervals. It may then be conveniently exhibited in pills; each pill containing from a quarter to half a grain or more of the tartar emetic.

To children the same solution of tartar emetic and salts may be given, or a solution of tartar emetic by itself, or powders of the same rubbed up with a little sugar. From the 12th to the 6th of a grain may be given, according to the age of the child, thrice a-day. When there is much febrile excitement, this plan will often prove effectual, while purgatives or tonics would produce little or no good.

3. *Purgatives.* In children labouring under phlyctenular ophthalmia there is commonly a full and hard abdomen, and a loaded state of the stomach and bowels. Even in feeble and emaciated children, it will usually be found that, by the exhibition of purgatives, a large quantity of morbid feculent matter will be discharged. In such cases the administration of purgatives is followed by marked benefit; and

without these, other remedies avail but little. In recent cases, a purge of calomel, with jalap, rhubarb, or scammony, will often be sufficient to remove the attack of ophthalmia altogether. Such a purgative is to be repeated at intervals of two, three, or more days, according to the urgency of the symptoms. It not only empties the bowels, but reduces very powerfully the impetus of the blood in the affected part, increases the action of the absorbents, and restores to a healthy state the secretions of the digestive organs. It proves, in short, alterative as well as depletive; and its use as such may be persisted in, in many cases, for a length of time, with very decided benefit. I have found a powder, containing from the sixth to the third of a grain of tartar emetic, with from 5 to 10 grains of rhubarb, given each night, to be of much service. The purgative plan is more useful than any other in those cases in which an impetiginous eruption over the body accompanies the affection of the eyes. Care, however, must be taken not to push its debilitating action too far.

4. *Sulphate of quina and other tonics.* In scrofulous ophthalmia it is of great importance to remove the debilitated state of the patient; for unless this is done, the eye will not recover. We attempt to increase the strength of the patient, chiefly by improving his powers of digestion. This is often accomplished by the remedies mentioned under the last head; and especially by the use of rhubarb, which both keeps the bowels regular and improves the action of the stomach. There are several other remedies belonging more decidedly to the class of tonics, which prove strikingly beneficial in the treatment of phlyctenular ophthalmia.

After a trial of many internal medicines in this disease, I have found none so useful as the sulphate of quina. It exercises a remarkable power over the constitutional disorder which attends this ophthalmia, and thereby over the local complaint. The dose which I employ is generally a grain thrice a day; in very young children, half a grain; and in adolescents or adults, 2 grains. It may be given rubbed up with a little sugar; but it appears to act best when administered in solution. For this purpose I use the acidum sulphuricum aromaticum, to which I add a sufficient quantity of syrup and water. In most instances the effects are very remarkable. Although I have met with a few cases which appeared to resist its beneficial influence, in most of the little patients to whom I have administered sulphate of quina, it has acted as a charm; abating, commonly in a few days, the excessive intolerance of light and profuse epiphora, promoting the absorption of phlyctenulæ, and hastening the cicatrization of ulcers of the cornea. As soon as the stomach has been cleared by an emetic, and the bowels put to rights by repeated doses of calomel with rhubarb, or some other such purgative, the use of this medicine may be begun, unless the pulse is very quick and the skin hot, when small doses of tartar emetic will be preferable; or when an impetiginous eruption is observed on the surface of the body, in which case a course of purgatives ought to be adopted.

I cannot forbear quoting from the journals of the Glasgow Eye Infirmary the two following cases, illustrative of the good effects of sulphate of quina: —

Case 277.—Jane Thomson, aged nine, was admitted on the 23rd of July, 1828, with phlyctenular ophthalmia of the right eye, of 14 days' standing. There was a deep ulcer near the centre of the cornea, surrounded by a broad effusion of lymph; and there was an onyx at the lower edge of the cornea. She was affected with night-sweats, and was much reduced in general health by bleeding, purging, and blistering. She was ordered to take 3 grains of quina daily, a drop of the nitras argenti solution was applied to the eye, and she had the murias hydrargyri collyrium.

On the 24th, the onyx was all but gone. On the 27th, the ulcer was reported as contracted. On the 29th, on account of an attack of bowel complaint, she was ordered 2 grains of calomel with a quarter of a grain of opium at bedtime. After this, the case continued steadily to improve, the ulcer cicatrized, the eye became strong, and the leucoma grew thin. In all probability, the cornea would speedily have been penetrated by the ulcer, if the depletory treatment had been persisted in, which this patient was undergoing before she came to the Eye Infirmary. Within 24 hours, the sulphate of quina had evidently arrested the progress of the disease.

Case 278.—James Tassie, aged eight, was admitted on the 15th of August, 1828, with phlyctenular ophthalmia of the right eye. He had been troubled with this complaint, more or less, for seven years. There was formerly a considerable albugo on the right cornea; but it had diminished much till within a fortnight before his admission, when a relapse took place. The cornea appeared to be rough and nebulous, but the intolerance of light was so great that it was with difficulty that any part of it could be exposed. The nitras argenti solution was applied, and he had a solution of tartar emetic, in divided doses, till vomiting was produced. Next day he could open the eye better, and an onyx was now observed at the lower edge of the cornea, which had not been perceived on the previous day. He was ordered to take a grain of sulphate of quina thrice a-day, and to use the murias hydrargyri collyrium. By the 18th, the onyx was gone. The extract of belladonna was applied to the eyebrow and forehead, some fears being entertained regarding the state of the iris. By the 20th, the intolerance of light having considerably subsided, the cornea could be more completely seen. The centre of it was found to be perforated by an ulcer, and the pupil contracted. On the 22nd, the eye continued easier, but the iris was observed to be everywhere in contact with the cornea. The sulphate of quina, belladonna, and collyrium, were continued. On the 27th, the iris appeared to be returning a little into its natural place, the pupil was partly visible, and he saw a little with the eye. On the 28th, the pupil was evidently expanding and the cornea clearing. By the 1st of September, the pupil was free of the cornea, except at its inner edge, where it still adhered by a single point. By the 16th, the iris was entirely free. Soon after this, the ulcer of the cornea cicatrized, the speck gradually cleared, and the eye retained a very considerable share of vision.

This last case was one of the most remarkable and pleasing recoveries from penetrating ulcer of the cornea and involved iris, which I have met with. The recovery was mainly attributable to the salutary operation of the sulphate of quina on the inflammatory affection, and to the effect on the iris produced by the belladonna.

As a substitute for the sulphate of quina, the sulphate of bebeerina may be given. The dose requires to be doubled.

Chalybeates stand next to the sulphates of quina and bebeerina among the tonic medicines worthy of confidence in the treatment of scrofulous ophthalmia. The precipitated carbonate of iron, and the tartrate of potash and iron, are the forms which I have found most useful. They are more effectual, however, in aphthous, than in phlyctenular ophthalmia. In both these affections such compounds as the citrate of iron and quina, and the iodide of iron and quina, will be found useful, and may be given in the form of syrup.

The mineral acids, and especially the sulphuric, will also produce a tonic effect.

We may set down the cold plunge or shower bath as a very efficient tonic in scrofulous ophthalmia; but it is not to be employed till after the acute symptoms have subsided. It proves one of the very best means for preventing relapses.

The employment of tonics, both medicinal and dietetical, must be continued long after all the inflammatory symptoms have disappeared, in order, if possible, to communicate to the constitution that degree of vigour, which may enable it to resist any tendency to relapse, which may still linger in the eyes, and which, were this precaution not adopted, might, on exposure to the slightest exciting cause, lead to a new and severe attack.

We may class change of air among the tonic remedies for this disease, or rather among the preventives which are to be employed after a first attack is subdued. A dry, warm, inland situation is preferable to the sea-coast. The glare from the sea is very apt to aggravate slight attacks, and give rise to relapses.

5. *Antacids.* There is reason to believe that phlyctenular ophthalmia frequently depends on acid generated in the stomach, whence proceeding into the bowels, it mixes with the bile, and produces green stools and general irritation. The teeth, in such cases, are apt to become carious. Under these circumstances, relief may often be obtained by using antacids, such as magnesia, its carbonate, or a mixture of rhubarb and bicarbonate of soda, in small doses frequently repeated. Carbonate of ammonia, with tincture of gentian, as recommended by Dr. Charles Armstrong[4] in common cases of scrofula, may also be employed with good effect.

6. *Mercury.* Calomel is very often administered in phlyctenular ophthalmia; more frequently, however, as a purgative than as an alterative. That this medicine is often injurious to children does not admit of doubt. That their constitutions are shattered by an indiscriminate use of calomel, and that in this way they are rendered more susceptible of suffering from the exciting causes of scrofula, is a truth which is too much overlooked.

Given as an alterative in phlyctenular ophthalmia, I have frequently known mercury prove injurious, because mistimed; that is to say, it was administered before the irritation attending the acute stage of the disease was moderated by depletion. After local blood-letting, and the use of evacuants, we sometimes find decided advantage from the exhibition of blue pill, or even of calomel with opium. In some cases this combination may be pushed with advantage, till the mouth is affected; as was done in the following case:—

Case 279.—Isabella Fitzsimmons, aged nine, was admitted at the Glasgow Eye Infirmary, 3rd of August, 1831, with the following symptoms. Numerous phyctenulæ round the upper edge of the right cornea, considerable reticular inflammation of the conjunctiva; tongue white; she is feverish and tosses during the night.

Tartar emetic, in divided doses, was ordered as an emetic, and a solution of nitrate of silver of the strength of 4 grains to the ounce of distilled water, was applied to the eye. On the 5th, the phlyctenulæ were observed to be diminishing in size, and the redness was less. On the 9th, the symptoms still abated. On the 12th, the phlyctenulæ were all but gone.

On the 17th, a new phlyctenula was observed at the lower edge of the cornea. She was ordered an ounce of sulphate of magnesia. On the 19th, there was general vascularity of the conjunctiva. On the 21st, a small ulcer was present on the centre of the cornea. She was ordered 12 grains of sulphate of quina in a

12-ounce solution; a table-spoonful to be taken thrice a-day. On the 2nd Sept., the inflammation was found to be increased, with an onyx at the lower edge of the cornea. Six leeches were applied to the right lids; a dose of calomel and jalap administered, and the quina augmented to ℈i in 12 ounces. Next day, a blister was applied behind the ear. On the 8th, the onyx was less. On the 9th, the quina was increased to ʒi. On the 13th, a considerable effusion of lymph was observed on the internal surface of the cornea, below the level of the ulcer. The eye was evidently in imminent danger. Extract of belladonna was smeared on the brow and upper lid. The quina was continued; but as this is a remedy of little, if any, power over adhesive inflammation, 2 grains of calomel, with the third of a grain of opium, were ordered at bedtime.

On the 15th, the pupil was somewhat dilated, and the lymph on the internal surface of the cornea was less. On the 16th, the lymph was much diminished. On the 18th, it was all but gone. The ulcer was still deep, but smooth. Numerous red vessels were seen creeping over the lower edge of the cornea. The pupil still kept dilated. The remedies were continued as ordered on the 13th.

On the 22nd, the pupil was widely dilated, the lymph completely gone, the ulcer contracted, and the cornea free of red vessels. The belladonna was omitted. On the 27th, the calomel and opium were stopped. On the 1st November a very small leucoma was the only remaining symptom.

This case affords a good example of the spread of inflammation from the investing membrane of the cornea to its proper substance, and from this to its lining membrane. It shows the danger of trusting to quina in every circumstance of scrofulous ophthalmia, and the favourable influence of calomel and opium, when adhesive inflammation of the cornea occurs in this disease.

7. *Iodine.* My experience of iodine and its preparations in phlyctenular ophthalmia, has not been sufficiently extensive to enable me to recommend them.

8. *Diaphoretics.* Keeping up a healthy action of the skin is of much importance. This may be promoted by the wearing of flannel next the skin, and by the use of the tepid bath every night, or every second night. The warm bath often greatly relieves the intolerance of light. It proves soothing and refreshing, and ought to be frequently employed. A tepid salt-water bath is highly useful. The tepid pediluvium every night, for weeks or months together, proves very serviceable; also warm fomentations of the belly, as in infantile remittent fever. Dover's powder at bedtime sometimes proves useful, by exciting a healthy action of the skin, as well as soothing irritation and procuring sleep. In cases where the perspiration is immoderate, this medicine is not less remarkable for its good effects than where the surface of the body is dry and husky. Tartar emetic operates also with good effect on the skin, and sympathetically on the conjunctiva.

9. *Anodynes.* Besides opium, which, in various forms, we find it expedient to exhibit occasionally in phlyctenular ophthalmia, a remarkable effect is obtained in soothing the pain and intolerance of light attendant on this disease, from the internal use of belladonna. The dried leaf, in powder, is the form usually chosen; and of this from one to two grains thrice a-day is the dose. If the vinous tincture is chosen, from three to ten drops may be given to a child thrice a-day.

10. *Inhalation of anæsthetics.* In March, 1847, I began to administer the vapour of sulphuric ether in several cases of scrofulous ophthalmia attended with great intolerance of light. I gave it to

the extent of producing slight insensibility for some minutes. The first dose, in one case, removed an intolerance of light of three months' standing, such that the patient, a girl of 16, had always been led to the Eye Infirmary, with her eyes spasmodically closed. That very day, and ever afterwards, she opened her eyes freely. In other cases, the same practice repeated daily, or every second day, produced similar good effects. I have derived the same benefit from the inhalation of chloroform.

The inhalation of anæsthetics not merely enables us deliberately to examine the state of the eyes while the patient is in the insensible state, and to make such applications to them as we may deem necessary, but proves a valuable means of subduing permanently the great irritability which so frequently attends the disease.

11. *Diet.* During the continuance of an attack of active inflammation, abstinence from animal food, and from all kinds of fermented and heating liquors, should be strictly enjoined; but when the acute symptoms have subsided, and the disease has assumed a chronic character, the patient ought to be put upon a rather generous diet. As there can be no doubt that unwholesome food is one of the chief causes of this ophthalmia among the poor, it is of much importance to procure for the patients in these circumstances a more invigorating diet. It is necessary strictly to forbid the use of articles likely to derange the stomach; as, pastry of every sort, comfits, vegetable jellies, and preserves; and of indigestible substances, as, unripe fruits, nuts, raisins, and the like.

12. *Temper.* This disease is extremely apt to render the child fretful, and, by mismanagement, to lay the foundation of bad temper, which, in its turn, tends much to prolong and aggravate the symptoms. We find that in good-natured children, and in those who are under proper management, the disease disappears much more readily; while in spoiled children, who cry perhaps for hours after the eyes are examined, or after the application of any remedy, it is apt to become almost incurable. It is of much importance to excite hope in the patient.

13. *Exercise—Sleep.* Children affected with this disease would lie in bed all day. This is not to be allowed. They should be washed and dressed betimes; and, weather permitting, taken out of doors, however great may be the intolerance of light. On the other hand, they are not to sit up late, nor to fatigue their eyes by attempting to read, draw, sew, or the like, by artificial light, but are to retire early to rest. "Si enim quid est juvans oculos, est somnus ipse."[5]

14. *Position in bed.* The head should be raised as much as possible during the night. On no account ought the child to be suffered to lie burying its face in the pillow.

Local remedies.— 1. *Shading the eyes.* The morbid irritability which marks this disease so strikingly through all its stages, is to be relieved by wearing a broad hat or bonnet, or by a green or black shade for both eyes. All employment of the eyes upon minute objects, especially in a strong light, is to be avoided. It will not be necessary to confine the patient to a dark room, nor to forbid him going abroad in fine weather. On the contrary, every inducement to open the eyes, to use them moderately upon large objects, and to take exercise out of doors, ought to be held out to the patient. We often see children labouring under this ophthalmia, having handkerchiefs bound over one or both of their eyes, especially when they are taken out of doors. This practice is decidedly injurious, heating the eyes too much, fostering the intolerance of light, and if one eye only is covered, often producing a squint.

2. *Evaporation.* In recent slight attacks, the inflammation, pain, and irritability, may be moderated by the use of evaporating and slightly astringent lotions, applied tepid or cold according to the feelings of the patient. In most instances, they agree better in the tepid state. Decoction of poppy-heads, with a few drops of alcohol; water, acidulated with a little vinegar, or to which a small quantity of sweet spirit of nitre is added; rose-water, or a weak solution of acetate of ammonia, will often answer the purpose. The application of cold water to the eyelids, face, and head, generally gives relief; but in many cases the reaction which follows seems hurtful. The same may be said of vinegar poultices, and alum curd, enclosed in a thin linen bag, and laid over the lids at bedtime.

3. *Fomentations.* When the symptoms are in any degree severe or of long continuance, warm soothing applications will be found more useful than cold ones. By means of a piece of sponge or flannel, the eyes may be fomented, several times in the course of the day, with a decoction of chamomile flowers, poppy-heads, or digitalis leaves, or with a watery infusion of opium, heated to about 100° Fahr. Much relief is experienced from exposing the eyes to the steam of warm water, or the vapour of laudanum or camphor, raised by means of a cupful of hot water. Belladonna and hyoscyamus in vapour or in fomentation, are of great service in relieving the intolerance of light. A solution of 1 grain of corrosive sublimate, and 6 grains of sal ammoniac, in 6 ounces of water, with 2 drachms of vinum belladonnæ, or from 1 to 2 grains of sulphate of atropia, is the collyrium which I have found the most useful; a table-spoonful being mixed with an equal quantity of hot water. It is to be used thrice a-day; and after the eyelids are carefully bathed with it externally, for the space of five minutes, a little of it ought to be allowed to flow in upon the eye.

4. *Scarification* of the inside of the eyelids, especially in chronic cases, where the palpebral conjunctiva is much loaded with red vessels, will be found one of the most valuable means of cure. In cases of vascular speck, division of the fasciculus of vessels running over the sclerotica to the albugo, can scarcely be dispensed with; no other remedy having the same power in checking this very annoying and dangerous symptom.

5. *Counter-irritation.* In scrofulous subjects we frequently find that the occurrence of disease in one part relieves another part which was previously suffering. Imitating this natural conversion of disease, when we find other means to fail, we employ blistering in scrofulous ophthalmia, and generally with great benefit. The intolerance of light is often suddenly removed by this remedy; the child being

enabled, in a few hours after the blister rises, to open its eyes, although it had not done so for months before. The temples, behind the ears, the crown and back of the head, and the nape of the neck, are the situations generally chosen for the application of blisters. The last is the most painful, but not the least effectual. In general, the discharge ought to be kept up, by the use of some stimulating dressing; or, if this is not done, a quick succession of blisters ought to be employed.

Friction on the nape of the neck with tartar emetic ointment is sometimes had recourse to in this disease, for the purpose of bringing out a crop of pustules. This is a practice much more painful than blistering, the pustular eruption sometimes spreads over the body and causes considerable constitutional disturbance; the pustules, if considerable in size, leave indelible pits, and, from mismanagement of the remedy, large portions of skin are sometimes made to slough; so that, on the whole, blistering is preferable. Dr. Salomon regards the tartar emetic eruption as the only sure remedy for the intolerance of light.[6]

Issues on the neck or on the arm were, at one time, much employed, and certainly proved beneficial in relieving the symptoms of phlyctenular ophthalmia, and in preventing relapses. They were in many respects, however, objectionable. I have known an issue in the arm to cause atrophy of the extremity, which continued for life. The improvements which have taken place of late years in ophthalmic medicine, have rendered such means less necessary.

6. *Stimulants* applied to the inflamed surface of the eye, in this disease, are decidedly useful. Indeed, it is scarcely possible to effect a cure without them. The impetiginous state of the conjunctiva, or, in other words, of the skin covering the eye, in this ophthalmia, not merely bears stimulants, but like most other chronic cutaneous diseases, is benefited by their application, if they be well chosen, carefully used, and properly timed. They often act as the best local sedatives, if applied after the acute inflammatory excitement is subdued by the general remedies already enumerated. Employed before this is effected, they will scarcely fail to prove hurtful. In this respect the treatment of phlyctenular ophthalmia is directly contrary to that of the puro-mucous inflammations of the conjunctiva; for in them we employ stimulants from the very first, but in the phlyctenular we must wait till the symptoms of irritation are somewhat abated.

Various stimulants have been used in scrofulous ophthalmia; but the nitras argenti solution and the red precipitate salve are the most deserving of confidence. Next to them I would place the vinum opii. Whichever be selected, its application must be continued with regularity once a-day, or once every two days, the child being laid in the horizontal position, the head fixed between the knees, and the lid opened so as fully to expose the diseased membrane.

The solution of 4 grains of the nitras argenti in 1 ounce of distilled water, is the stimulant which I generally employ. It evidently possesses very considerable power in abating the vascularity of the conjunctiva, hastening the absorption of phlyctenulæ, promoting the cicatrization of ulcers, and clearing specks of the cornea. The relief which it affords to the intolerance of light, is not the least of its good effects. We not unfrequently observe that a single application of this remedy will effect so much relief that, by next day, the patient is able in a moderate light to keep the eyes half open, without uneasiness, although previously he could not bear the least accession of light. In producing this effect, it probably operates by inducing the healing of minute ulcerations, and the contraction of enlarged blood-vessels, both of which give rise to the sensation of sand in the eye, to spasm of the lids, and epiphora. Whenever ulceration is present on the cornea, recourse should be had to the solution of nitras argenti. A stronger solution than that of 4 grains to the ounce may be employed, and with a small camel-hair pencil applied directly to the surface of the ulcer, without permitting the solution to spread over the rest of the eye.

The staining of the conjunctiva of an indelible olive hue, and the black cicatrice of the cornea, which sometimes follow the use of nitrate of silver, are serious objections to this remedy. I am unable to say anything farther regarding the latter effect, than simply that I am convinced of its occasional occurrence. The former effect is the result only of a long-continued daily application of the solution in question, and may therefore be avoided.

7. *Solid caustic.* When an ulcer threatens to penetrate deep into the substance of the cornea, or when it has already perforated into the anterior chamber, it is proper to touch the ulcer, or, if there is prolapsus of the iris, the myocephalon, every second or third day, with a pencil of lunar caustic, filed to a sharp point. Scarpa has given[7] the best account of the effects of this remedy, to which I shall again have occasion to refer, under the head of *Ulcers of the Cornea.*

8. *Mydriatics.* The case of James Tassie, already detailed at page 492, strikingly illustrates the utility of the extract of belladonna in central ulcer of the cornea. Even when a portion of iris is involved in such an ulcer, the dilating power of the belladonna may be sufficient to free it, and thus to preserve the pupil entire. In cases of perforating ulcer near the edge of the cornea, we can have recourse to the use of belladonna with less confidence; for while the dilatation cannot, in this case, be carried so far as to remove the iris from the vicinity of the ulcer, it is doubtful whether the state into which the iris is thrown, is not apt to favour, rather than prevent prolapsus.

Belladonna is of great service in subduing the intolerance of light; indeed, it may be regarded as a specific for this distressing symptom. A good mode of applying it is to expose the eyes to a teaspoonful of its vinous solution, raised into vapour, by being added to a teacupful of boiling water. An ointment, containing extract of belladonna, rubbed round the eye, is serviceable; as is also the collyrium of murias hydrargyri with vinum belladonnæ, already noticed. Similar benefit is to be derived from the salts of atropia, and from other mydriatics, besides belladonna; such as hyoscyamus and stramonium.

9. *Applications to the Schneiderian membrane.* It has been sug-

gested by M. Morard, that scrofulous ophthalmia is caused and kept up by a diseased state of the mucous membrane of the nostrils. He cures this by the application of a solution of nitrate of silver, of the strength of a scruple to an ounce of water, and by this means, he says, the ophthalmia is removed.[8] It is certainly proper to endeavour to cure all the concomitants of the disease; although it seems more likely that the irritating discharge of the tears is the cause of the inflamed state of the nostrils, than that the latter keeps up the ophthalmia.

Relapses.—No disease is so apt to recur as phlyctenular ophthalmia. It is therefore necessary for children who have once suffered from it, to be submitted, from time to time, to the inspection of their medical attendant, who must endeavour promptly to subdue every symptom of a re-attack, and to conduct his patients safely through that period of life which is most exposed to the disease. In this way much mischief will easily be prevented, which, should the disease be neglected, may require years to remove, or prove altogether beyond remedy.

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[1] Beiträge für practische Medizin und Ophthalmiatrik; Vol. i. p. 3; Leipzig, 1812.

[2] Mirault, Archives Générales de Médecine; Tome xx. p. 477; Paris, 1829.

[3] Weller, Krankheiten des menschlichen Auges. p. 469; Wien, 1831.

[4] Essay on Scrofula; in which an Account of the Effect of the Carbonas Ammoniæ, as a Remedy in that Disease, is submitted to the Medical Profession; London, 1812.

[5] Fallopius.

[6] Ammon's Zeitschrift für die Ophthalmologie; Vol. ii. p. 329; Dresden, 1832.

[7] Trattato delle principali Malattie degli Occhi; Vol. i. p. 280; Pavia, 1816.

[8] British and Foreign Medical Review for April 1847, p. 373: Edwards, Lancet, April 8, 1848, p. 389.

SECTION XII.—MORBILLOUS AND SCARLATINOUS OPHTHALMIÆ.

Fig. Beer, Band I. Taf. II. *fig.* 3.

A certain degree of conjunctivitis always attends measles and scarlet fever, but is in general much less severe than the variolous inflammation of the eye. In measles and scarlet fever, the change which the skin undergoes, amounts to little more than vascular congestion; and the conjunctiva, a prolongation of skin, betrays therefore little more during the presence of these diseases, than some degree of redness, with intolerance of light, slight pain, and epiphora. Occasionally, however, we meet with phlyctenulæ, onyx, and ulcers of the cornea, brought on by the morbillous and scarlatinous ophthalmiæ, particularly when the subject is scrofulous. Indeed, it is difficult to distinguish either of these ophthalmiæ from the scrofulous till the eruption of the skin makes its appearance. On the other hand, we often hear of the dregs of the measles or scarlet fever producing affections of the eye and eyelids. By this it is generally meant, that the scrofulous diathesis has been called into action by these diseases, and that ophthalmia tarsi, or phlyctenular conjunctivitis has been the result.

In measles there is a catarrhal affection of the Schneiderian membrane, with sneezing and cough, and occasionally the attending conjunctivitis is not so much eruptive as blenorrhœal. I have seen cases in which the eye had been destroyed by severe puro-mucous ophthalmia excited by measles. In scrofulous subjects exposed to cold after measles, a puro-mucous inflammation of the conjunctiva, or scrofulo-catarrhal ophthalmia, is a frequent occurrence. In weakly ill-nourished infants, cough, great emaciation, and ulceration of the cornea, ending in staphyloma, are not uncommon sequelæ of measles. I have also seen a case, in which both eyes collapsed after scarlatina, bursting, as I understood, from puro-mucous ophthalmia. The child was at the same time totally deprived of hearing from suppuration of the ears. Mr. Bowman mentions an instance of five boys of one family having scarlet fever, of whom two lost their sight by sloughing of the cornea, within a week of their seizure. One of the two died; the other was brought to Mr. B. with the globes sunk. There was no previous debility discoverable in these children, to account for this unusual destruction of the cornea.[1]

In some rare cases of scarlatinous ophthalmia, the iris and capsule of the lens become affected. I operated, some time ago, on a boy of about eight years of age, in whom specks of the anterior hemisphere of the capsule were brought on in this way.

Treatment.—The affection of the eye in measles and scarlet fever, does not in general require active treatment. The eyes should be guarded from strong light, bathed occasionally with tepid water, and and the bowels kept freely open. If the symptoms are more than commonly severe, leeches may be set on the temples, and blisters applied behind the ears, or to the nape of the neck. The nitras argenti solution will be found highly useful, whether the ophthalmia be eruptive or puro-mucous. Sulphate of quina may be given internally with good effects.

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[1] Lectures on the Parts concerned in the Operations on the Eye, p. 110; London, 1849.

SECTION XIII.—VARIOLOUS OPHTHALMIA.

Fig. Beer, Band I. Taf. II. *fig.* 2.

In former times, small-pox proved but too often the cause of serious injury to the eyes, or even of entire loss of sight. It was by far the most frequent cause of partial and total staphyloma. But since the introduction of inoculation, and still more of vaccination, such injurious effects from variolous ophthalmia, are comparatively rare.

Symptoms.—In most cases of small-pox, pustules form on the external surface, and on the margins of the eyelids. When they are numerous, as in confluent small-pox, they cause such swelling of the lids as completely to close the eyes. As the disease proceeds, matter is discharged partly from the Meibomian follicles, partly from the variolous pustules; the eyelids are glued together so that the eyes cannot be opened for days; and merely from this state, without any pustules being formed on the conjunctiva, the eyes are irritated and painful. At last, as the disease subsides, the swelling of the lids falls, so that they are again opened, and the eyes may be found uninjured. It is in this way that the vulgar talk of persons being blind in small-pox for so many days, and recovering their sight. But although the cornea has not suffered in such cases, the eyelids and the lacrymal apparatus are often left in an injured state; and not unfrequently small-pox proves the exciting cause of scrofulous affections of the eyes and eyelids, which may continue troublesome for years. The small-pox pustules on the lids are apt to destroy the eyelashes, to leave red marks and scars, render the edges irregular and liable to inflammation and excoriation from slight causes, and to produce ophthalmia tarsi, and very frequently trichiasis and distichiasis. Chronic blenorrhœa of the lacrymal sac, and phlyctenular conjunctivitis, are also frequent sequelæ of small-pox.

Schemes have been proposed for preventing the pustules of small-pox from spreading to the face, or at least for moderating the effects of the eruption. We find that this disease is apt to attack with peculiar severity any part of the surface of the body labouring at the time under accidental irritation, and hence it has been supposed that soothing applications might moderate the eruption and its effects. Covering the face with a cloth spread with cerate, and fomenting it from time to time with chamomile decoction, have been used for this purpose, and can do no harm. When the pustules on the eyelids are fully matured, we may afford considerable relief by pricking them one by one with a needle, so as to evacuate their contents; and by carefully removing the crusts which form after the pustules burst, having first softened them with some mild ointment. The lids are frequently to be bathed with tepid milk and water, and bits of soft rag moistened with the same are to be laid over them.

§ 1. *Conjunctivitis variolosa.*

There is in every case of small-pox, some redness of the conjunctiva, constituting the *primary variolous ophthalmia* — *conjunctivitis variolosa.* But danger has been chiefly apprehended from the formation of a variolous pustule or pustules on the cornea. A pustule on the cornea, forming at the time of the general eruption, would certainly be extremely apt to prove destructive. The pustule bursting, an ulcer would be formed, which would probably deepen and spread. If the cornea were penetrated, the iris would advance and adhere to the cornea, and the pupil might thus be obliterated. A considerable portion of the cornea being destroyed by ulceration, partial staphyloma might be the result. In bad cases, almost the whole cornea might be destroyed, by infiltration of matter and ulceration, and total staphyloma would then ensue.

During the suppurative stage of small-pox it is difficult to say what extent of mischief may be going on in the eye, under the closed and swollen eyelids. If the patient feels pain in the ball itself, with dryness, stiffness, and a sensation of sand in the eye; if the uneasiness be much increased on attempting to move the eye, or on exposing it to light even through the swollen lids; and if, in addition to the matter discharged from the pustules on the edges of the lids and from the Meibomian follicles, there is a frequent discharge of hot tears; then it is probable that there is acute variolous conjunctivitis.

If the eye is easy, only shut up from the state of the lids, there is probably no danger.

When the eyes come to open, the cornea, though seldom, if ever, disorganized, may be found totally opaque from interstitial deposition, so that the pupil and iris cannot be seen.

§ 2. *Corneitis postvariolosa.*

Syn. — Das Nachpocken, *Beer.*

The eyes are not safe, even after the small-pox pustules over the body have blackened and the scabs fallen off. On the contrary, it is then that the chief danger is apt to occur. I have often seen both central abscess of the cornea and onyx at its lower edge, produced after the general eruption was completely gone. This state has been called, with sufficient propriety, *secondary variolous ophthalmia* — *corneitis postvariolosa.* It generally occurs about the 12th day of the eruption, when the pustules over the body are subsiding, but sometimes as late as five or six weeks after the patient has recovered from the primary disease. In children, especially scrofulous children, the disease is truly a corneitis; in adults, there is often a combination of iritis with corneitis.

A dull whitish point is observed a little below the centre of the cornea, with surrounding haziness; the whiteness becomes slightly elevated and more extensive, amounting perhaps to the 12th of an inch in diameter, and then the part becomes yellow, and is almost certain to fall into a state of ulceration. If two or more such points should form, the whole cornea is rendered nebulous; or this effect may be produced even from one large central abscess. An onyx at the same time may appear at the lower edge of the cornea. The sclerotica is reddened. Pain and epiphora are excited on exposure to light. In adults, the iris is discoloured, and the pupil contracted, irregular, and more or less filled with lymph.

The secondary variolous ophthalmia seldom leads to destruction of the cornea, unless the case is altogether neglected. By proper treatment, the matter of the abscess or onyx is generally absorbed. In other cases, ulceration takes place, leaving, after cicatrization, a leucoma, which is likely to be permanent. The surrounding haziness of the cornea is gradually dissipated; vision is injured according to the situation and size of the leucoma. By the formation of an artificial pupil, vision may in some cases of this sort be restored. Even when partial staphyloma has formed, this operation is occasionally applicable. If the whole cornea is destroyed by suppuration and ulceration in the course of secondary variolous ophthalmia, the result is total staphyloma. This rarely happens, unless there is a high degree of secondary fever, with much feebleness and emaciation. Indeed, we seldom meet with secondary variolous ophthalmia, without the skin being hot and dry, the pulse quick, and other symptoms of synocha present. When the constitutional symptoms run high, and the eye falls into phlegmonous ophthalmitis, or complete suppuration, the case is apt to terminate fatally. Puncturing the eye under such circumstances as Louis[1] recommended, may be the means of saving the life of the patient.

The general notion, that pustules are apt to form on the conjunctiva and cornea, at the time of the general eruption, has been controverted by Dr. George Gregory. In a report[2] of some observations of his at the Westminster Medical Society, he is made to say, that except the mucous membrane of the fauces, larynx, and trachea, no mucous membrane is capable of taking on the variolous action. Even the eye, which so frequently suffers from small-pox, Dr. Gregory affirms to do so from common inflammation only, the pustule on the cornea not appearing till the eruption is on the decline, and therefore not being a primary or essential feature of the disease. I have never seen a primary variolous pustule on the cornea, nor on any part of the conjunctiva. Dr. W. Brown informs me that, along with the primary eruption, he once saw a pustule on the inside of the lower lid. The opinion of Dr. Gregory has been supported by Mr. Marson[3], whose position as surgeon to the Small-pox Hospital in London, has afforded him opportunities for investigating the point in question. Mr. Marson has never seen a small-pox pustule on the eye. The eye appears to him to possess complete immunity from the primary eruption. He considers the destructive inflammation of the eye which follows small-pox, as entirely a secondary affection, and as analogous to the sloughing of the cellular membrane, in other parts of the body, which is a frequent sequela of the disease. As far as I am able to judge, the destruction of the eye in the secondary variolous ophthalmia is effected by the formation, not of a pustule on the surface, but of an abscess in the substance of the cornea.

Treatment.—1. The best general treatment of small-pox must be followed, in the first instance; a moderate temperature, tepid ablution, and a cool regimen. Emetics are occasionally useful; even blood-letting may be cautiously employed in some cases, and laxatives are always to be administered. If the eyes are particularly affected, they must be frequently bathed with tepid water or poppy decoction, and the edges of the lids smeared with a little cold cream. In many cases, the lids are so much swollen, and so completely sealed up, that it would be in vain to attempt any application to the conjunctiva, till the eruption begins to fade and the swelling to fall. Leeches may be applied, not only without impropriety, but with decided advantage, behind the ears or on the temples, and followed, if it appear necessary, by blisters. Perhaps we might prevent the eyes from becoming much affected, by applying leeches behind the ears. Two or three leeches being allowed to hang till they fall off, two or three others are to be applied, and so on, till a considerable quantity of blood has been abstracted. This is likely to reduce the irritation about the face, and to save the eyes. About the 8th or 9th day of the eruption, free purging will be found useful, not merely in reducing the suppurative fever, but in relieving the uneasy and inflamed state of the eyes. The lids now begin to be opened, so that a little fluid can be injected between them and the eyeball. A weak solution of nitras argenti, or diluted vinum opii, may be used for this purpose. The absorption of opaque depositions in the cornea will be promoted by these applications, and by the internal use of tonics and alteratives.

2. As for the treatment of secondary variolous ophthalmia, I have found tartar emetic, given so as to vomit and purge freely, to be productive of the best effects, in abating the inflammation and promoting the absorption of any abscess which may have formed in the cornea. Leeches and blisters are also useful. As soon as the inflammation is somewhat reduced by these means, advantage will be gained by putting the patient on a course of sulphate of quina. In cases of chronic ulcer, mercury acts very beneficially; or a mixture of mercury with sulphate of quina, such as one grain of the sulphate of quina with a grain and a half of hydrargyrum cum creta, thrice a-day. Undiluted vinum opii appears to answer best as a local application. The eye is to be touched with it once a-day. Belladonna is to be applied to the eyebrow and eyelids, in order to keep the pupil dilated. If iritis is present, the patient must be bled and brought under the constitutional action of mercury.

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[1] See case of two sisters. Mémoires de l'Académie Royale de Chirurgie; Tome xiii. p. 281; 12mo; Paris, 1774.

[2] Medical Gazette; Vol. v. p. 222; London, 1830.

[3] Ibid.; Vol. xxiv. p. 204; London, 1839.

SECTION XIV. — ERYSIPELATOUS OPHTHALMIA.

Fig. Beer, Band I. Taf. I. *fig.* 3.

Idiopathic erysipelatous conjunctivitis is a rare disease. It is easily discriminated from any other form of conjunctival inflammation.

Symptoms.—It commences with a slight feeling of tension in the eye and parts immediately surrounding it. The conjunctiva becomes of a pale red colour, and rises in soft yellowish-red vesicles round the cornea. These take a different form from every motion of the eyelids, and are sometimes so large as to project from between their edges. On strained or rapid motion of the eyeball or eyelids, the patient feels a pricking pain in the eye. When the eyelids are a little open, the folds of the swollen conjunctiva give the patient the appearance of one who is weeping, and we expect that every moment the tears will drop from his eye; but on a nearer inspection, and on pressing down the lower eyelid, we discover the mistake, into which we are the more ready to fall, as during this inflammation there frequently is a discharge of tears, especially on sudden changes of temperature. The eye is somewhat impatient of light. No other diseased appearances are observed in the eye itself, and the eyelids may be entirely free from redness or swelling. At the end of the acute stage, the pain of the whole eye is increased, still exciting in the mind of the patient the comparison of pressing or stretching, especially on moving the eye or eyelids.

As the disease continues, the redness of the conjunctiva increases. It becomes indeed so generally red, that we discover no longer a mere network of blood-vessels; but a general, yet pale and sometimes livid redness. Yet this pale red colour is not uniform. It is contrasted with spots of different sizes, of a bright red colour, which arise from extravasation of blood into the areolar tissue between the conjunctiva and sclerotica. The vesicles become more considerable, and project still more from between the half-opened eyelids. The spaces between the vesicles are covered with a thin white mucus, which is secreted in unnatural quantity by the conjunctiva and Meibomian glands. The discharge of tears is also increased. During the night the eyelids are glued slightly together; when they are opened, the cornea appears somewhat dim; but after the eye has been carefully cleaned, we see that the apparent dimness of the cornea arises from mucus collected on its surface.

As the disease subsides, the secretion of mucus returns to its natural quantity, the redness of the conjunctiva disappears, and those portions of the membrane which had been elevated in folds or vesicles, re-approach and re-attach themselves to the tunica albuginea and sclerotica. The discharge of tears ceases to be so frequent and so abundant. The spots from extravasated blood are the last symptom to disappear. There continues, even for a long time, such a diminution of the connection between the conjunctiva and sclerotica at these places, that the conjunctiva falls into wrinkles whenever the eyeball is moved. It is long before it completely recovers its natural elasticity.

Causes. This disease arises from sudden changes of atmosphere, slight blows, the stings of insects, and various other causes. I have more than once seen the irritation arising from chlorine gas, produce erysipelatous ophthalmia.

Treatment.—Much depletion is not necessary. The exhibition of a purgative, and the use of gentle diaphoretics, will in most cases constitute the whole of the general treatment. It may sometimes be proper to open the vesicles with the point of a lancet. The local treatment may be gathered from the following case:—

Case 280.—Mary Macdonald, aged 20, was admitted at the Glasgow Eye Infirmary on the 1st March 1832, eight days before which she had rigors, followed by headache and erysipelatous inflammation of the conjunctiva, without any affection of the integuments. The conjunctivæ were of a pale red colour, and on one side the membrane hung in soft masses from between the eyelids. The tongue was white, and the patient complained of thirst. She had applied leeches to the temples, and taken a dose of sulphate of magnesia. She was inclined to attribute the affection of her eyes to exposure to the emanation from a solution of chloride of lime. She was ordered 1 grain of muriate of mercury in 8 ounces of water as a collyrium.

On the 2nd, the swelling of the conjunctivæ was much abated, and the eyes easier. The four-grain solution of the nitrate of silver was applied to the inflamed surface.

On the 6th, the swelling was gone, and the redness much less. The solution and collyrium were contiuued.

On the 10th, she was ordered ℈j. of precipitated carbonate of iron thrice a-day; and on the 18th, was dismissed cured.

SECTION XV. — RHEUMATIC OPHTHALMIA.

Syn. — Sclerotitis. Sclerotitis idiopathica.

Fig. Wardrop, Medico-chirurgical Transactions, Vol. X. Pl. I.

It has been already stated, that there are three ophthalmiæ frequently produced in adults from atmospheric influences; *viz.* the catarrhal, the rheumatic, and the catarrho-rheumatic.

Diagnosis.—The following particulars will serve sufficiently to distinguish rheumatic from catarrhal ophthalmia: —

1. *Seat of the disease.* The catarrhal ophthalmia is an affection of the conjunctiva; the rheumatic has its seat in the albuginea and sclerotica, and frequently extends, in some degree, to the iris, and even to the retina.

2. *Redness.* The redness in the catarrhal ophthalmia is reticular, and the turgid vessels are evidently conjunctival; in the rheumatic, the chief redness is radiated or zonular (*fig.* 50. p. 433.), and seated under the conjunctiva, or in the deep-seated conjunctival, or sclerotic, network. We never see spots of blood extravasated under the conjunctiva in rheumatic ophthalmia; whereas, this is a frequent occurrence in catarrhus oculi.

3. *Nature of the inflammation.* The catarrhal ophthalmia is an inflammation of a mucous membrane, and is a blenorrhœal or profluvial disease, attended with an increased and morbid secretion of mucus; the rheumatic attacks the fibrous membranes of the organ of vision, and is unattended by any morbid secretion from the surface of the eye.

4. *Pain.* The pain in the catarrhal ophthalmia arises on the surface of the conjunctiva, is compared to the sensation of roughness, or to the feeling which might be excited by sand or broken glass under the eyelids, does not extend to the head, and is felt most in the morning, or when the eyes begin to be moved; the pain of the eyes in the rheumatic ophthalmia is pulsative and deep-seated, the chief pain, however, is not so much in the eyeball, as round the orbit, under the eyebrow, and in the temple, cheek, and side of the nose, and is severely aggravated from sunset till sunrise.

Were I asked, "What is meant by *rheumatic* ophthalmia?" I should answer to the following effect: —

1. By rheumatic ophthalmia, I mean simply inflammation of the fibrous membrane of the eye (the sclerotica), and of the adjacent parts of similar structure, excited by exposure to cold.

2. I do not regard this ophthalmia, as an inflammation differing *in kind* from common inflammation, in consequence of the existence of what has been called the rheumatic habit, or diathesis. The train of symptoms seems to depend, not on the constitution of the person, but on the structure and functions of the part affected.

3. Rheumatic subjects are by no means exempt from this ophthalmia; yet it frequently occurs in individuals who have never suffered from rheumatism in any other part of the body.

4. When rheumatism quits a joint and attacks the heart, we say it is a *metastasis;* but such a translation of rheumatic inflammation to the eye, I have never myself observed. In all the cases of rheumatic

sclerotitis which I have witnessed, the disease was primary, whether in rheumatic or non-rheumatic subjects; never metastatic.

5. I have adopted the term *rheumatic ophthalmia;* but, perhaps, *sclerotitis idiopathica* would be a truer appellation. It must be confessed, however, that this inflammation of the eye resembles rheumatism in its exciting causes, accompanying pain, exacerbations, and cure. It has not been generally recognised as rheumatic, probably because it attacks structures which are covered only by a thin semitransparent membrane, and therefore exposed to direct examination; while the other seats of rheumatism are hid from our view by the whole thickness of the integuments, and are the subjects, therefore, more of conjecture than of actual observation.

Degree of frequency.—Pure rheumatic ophthalmia is comparatively a rare disease. For one case of pure rheumatic, we meet with perhaps ten cases of catarrhal ophthalmia, and six of that mixed kind called catarrho-rheumatic, in which both conjunctiva and sclerotica are affected, and the symptoms of the two former ophthalmiæ are combined. We seldom see both eyes affected with rheumatic ophthalmia at once. When both are attacked, the one is always much more severely inflamed than the other.

Local symptoms.—1. The fasciculi of vessels advance in radii towards the edge, and sometimes even a little over the edge of the cornea. They are of a bright red colour, and surround the cornea pretty equally on all sides. Although probably the same radiating vessels which are seen in iritis, they appear larger and more turgid than in that disease, and rise more from the surface of the sclerotica. In iritis, these vessels are filled only sympathetically; here they are affected idiopathically. The conjunctivitis which attends this ophthalmia is slight, and never such as to mask the radiated inflammation of the sclerotica.

2. There is, in general, no tendency to chemosis in pure rheumatic ophthalmia, nor do the eyelids take part in the disease, so as to glue the eye up after sleep.

3. Dimness of vision uniformly attends this ophthalmia, depending on an accompanying haziness of the cornea and pupil, attended by a slight contraction of the latter, and sluggishness in the movements of the iris. If only one eye is affected, which, at least for some time, is generally the case, the pupil of that eye is seen at once to be less than that of the sound eye. The iris becomes slightly discoloured; it becomes greenish, for instance, if naturally blue; and the attending iritis may proceed even to effusion of coagulable lymph within the pupil. It must be understood, however, that a severe degree of iritis rarely attends rheumatic ophthalmia.

4. Except haziness of the cornea and pupil, which may be attributed to slight effusion, it has never happened to me to witness any other of the secondary phenomena of inflammation in idiopathic sclerotitis. I have not seen the disease terminate in any form of suppuration or of ulceration, both of which are very common in catarrho-rheumatic ophthalmia.

5. The access of light does not in general prove very distressing to the patient. The affected eye feels dry and hot in the early

period of the disease; but after a time, especially when the symptoms are somewhat abated by blood-letting, there is considerable epiphora.

6. The pain which attends rheumatic ophthalmia at its commencement, is of a stinging kind, and extends from the eyeball to the orbit and neighbouring parts of the head. These parts feel hot to the patient, and even to the hand of the observer. The pain is strikingly augmented by warmth; but relieved by perspiration. It often affects the forehead, the cheek-bone, and the teeth; extending sometimes even to the lower jaw. Occasionally, it is precisely confined to one half of the head. In some instances, it is severe on the side of the nose, or within its cavities, or in the ear. But, above all, the super-ciliary ridge is its chief seat, and next to it the temple and the cheek. Not unfrequently the pain has the acute pulsatory character of phlegmon, especially when felt chiefly in the eyeball; in other cases, and particularly around the orbit, it consists rather in an agonizing kind of feeling, which distresses and wearies out the patience of the person affected. It never ceases entirely, so long as the disease continues; but it varies much in degree, coming on with severity about four, six, or eight o'clock in the evening, continuing during the night, becoming most severe about midnight, and abating towards five or six in the morning; till then, totally preventing sleep, and occasioning great distress. The patient never fails, in the history he gives of his case, to insist on the nocturnal pain, and with his finger to point out its supra-ocular or circumorbital seat. It affects much more the forehead, temple, cheek, and side of the nose, than the eyeball. It is reasonable to conclude that, in this disease, the periosteum in and round the orbit and the fascia of the temporal muscle, structures similar in nature to the sclerotica, may also be affected with rheumatism. The chief seat of the pain, however, appears to be one or more of the six branches of the fifth nerve, which, radiating from the orbit, are distributed to the face, and we may fairly suppose a considerable portion of the pain to arise from the sympathy which these nerves have with those distributed to the interior of the eyeball, and which lie imbedded on the inside of the sclerotica.

Constitutional symptoms.—A considerable degree of symptomatic fever attends this disease, increasing along with the nocturnal paroxysms of pain. The pulse becomes frequent, and sometimes strong, full, and hard. The tongue is white and furred, and the mouth ill-tasted; there is more or less nausea, and the skin is hot and dry. The digestive organs are deranged, the appetite impaired, the bowels generally confined, and the excretions morbid.

The progress and severity of the disease vary much in different cases. In some the attack is slight, and soon goes off, without permanently injuring the organ. At other times, it is extremely severe, and, if misunderstood, may soon destroy vision. Not unfrequently the disease falls into a chronic state, without being very severe.

Exciting causes.—Rheumatic ophthalmia may be distinctly traced, in most instances, to exposure of the eye to a continued stream of cold air, while the head and face are in a state of perspiration. The patient, in the history which he gives of his case, commonly mentions some particular exposure of this sort, soon after which the redness and rheumatic pain commenced; for example, sleeping with the head exposed to the air entering by a chink in the wall, or by a broken pane of glass; travelling during the night in a carriage, with one side of the head close to a broken window; suddenly issuing from a crowded room into the cold air of the street; exposure to the current of air which flows from the stage into the body of a theatre; keeping wet clothes on the head when over-heated; and the like.

I have not observed that this disease is much more apt to occur at one season of the year than another. It is certainly more prevalent when the wind is cold and north-easterly. It is much more apt to attack persons of middle age than either the young or the old. Indeed, I have never seen it in children, nor in those far advanced in life. Probably the same exciting causes which, in persons of middle-life and robust constitution, are apt to produce rheumatic ophthalmia, would in a child excite catarrhal or scrofulous ophthalmia, and in an old person the catarrho-rheumatic or arthritic. Rheumatic ophthalmia is very apt to re-attack an individual who has previously suffered from it.

Prognosis.—If the disease is taken in time, the prognosis is favourable. Allowed to proceed in its course, the pupil may close, or the anterior crystalline capsule be left opaque.

Treatment.—1. *Blood-letting.* In all cases of rheumatic ophthalmia, it is necessary to take away blood from the arm, and in general, to follow this up by the application of leeches to the forehead and temple. I feel myself obliged wholly to differ from Mr. Wardrop's opinion, that patients affected with rheumatic ophthalmia, neither bear bleeding to a great extent, nor are much relieved by this remedy. He has even stated the little relief afforded by bleeding in this disease as one of its diagnostic characters.[1] This entirely disagrees with my experience; and is, I apprehend, altogether contrary to what we observe in other rheumatic affections. Bleeding, both general and local, I have uniformly found extremely useful in rheumatic ophthalmia, and I believe it ought seldom, if ever, to be omitted. The blood drawn is generally very buffy. The buffy coat is not dark yellow as in hepatitis or in syphilis; but whitish, as in pleuritis. The first night, after taking from 15 to 20 ounces from the arm, the patient is often so much relieved as to get some sleep, even though no other remedy be employed. Next day, I am in the habit of applying a dozen of leeches around the eye; but, if the pulse be still strong and full, and the circumorbital pain not relieved, I first repeat the venesection, and I have had cases under my care which required venesection to be repeated five or six times, before the severe circumorbital pain and other acute symptoms subsided in any considerable degree.

2. *Calomel and opium.* I have never failed to find this combination highly useful in checking the circumorbital pain, and dissipating the other symptoms. A pill, containing 4 grains of calomel with 1 grain of opium, is to be administered every evening till the gums begin to be affected, when the calomel may be omitted, and 10 grains of Dover's powder substituted for the opium. In some cases, smaller

but more frequent doses of calomel and opium may be proper, such as 2 grains of calomel with half a grain of opium thrice a-day. Mr. Wardrop states that mercury, given in this disease so as to produce ptyalism, aggravates more than mitigates the symptoms. This does not correspond with what I have observed. I do not, indeed, push the mercury to make the mouth sore, but I have not witnessed any bad effects from the gums becoming affected.

3. *Opiate frictions.* The patient experiences great relief from carefully rubbing the forehead and temple with warm laudanum, or with extract of belladonna infused in laudanum. This ought to be done about an hour before the nocturnal paroxysm is expected, which it will greatly assuage, and sometimes entirely prevent. In chronic cases, equal parts of laudanum and tincture of cantharides form a useful liniment.

4. *Blisters* behind the ear, and to the temple, but above all a large blister to the nape of the neck, will be found useful.

5. *Belladonna.* During the whole course of rheumatic ophthalmia, the pupil of the affected eye ought to be kept under the influence of belladonna, either by painting the moistened extract upon the eyebrow and eyelids morning and evening, but especially at bedtime, or by infusing 1 drachm of the extract in each ounce of the laudanum which is used for rubbing the head.

6. *Purgatives.* A smart dose of laxative medicine ought to be administered at the commencement of the treatment. Afterwards, a laxative clyster every morning, or a small dose of Epsom salts may be employed, to obviate the constipating effects of the opium. More powerful purgatives are now improper, as they would carry off the calomel and opium, and thereby prevent their good effects.

7. *Sudorifics.* The warm pediluvium at bedtime, with diluent drinks towards evening, operating along with the opium, will, in general, excite a sufficient degree of diaphoresis. Mr. Wardrop recommends antimonial powder, and Beer employed guaiac, for exciting the skin in this disease.

8. *Tonics.* Small doses of sulphate of quina, or of the mineral acids, will be found advantageous in the chronic stage of the disease, and during convalescence. In old mistreated cases, Fowler's solution sometimes gives great relief, in doses of from 8 to 12 drops thrice a-day.

9. *Vinum opii.* Applications to the eye itself have but little power over this disease. Those which are so useful in other ophthalmiæ, are often hurtful in the rheumatic. The lunar caustic solution, for instance, which may be regarded as a specific in catarrhal ophthalmia, is in the present disease decidedly injurious. When all the febrile and painful symptoms, however, are gone, and little more than lingering redness, with weakness of the eye, remains, the vinum opii, in a diluted state, will be found beneficial, dropped upon the eye twice or thrice, or the pure vinum opii, once, daily.

The first, second, third, and fifth of these remedies are to be had recourse to in the first instance. I have never found them fail in any acute case, however severe; nor have I witnessed any permanent sequelæ, when the plan of treatment now explained was adopted with the necessary vigour.

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[1] Medico-Chirurgical Transactions; Vol. x. p. 13; London, 1813.

SECTION XVI. — CATARRHO-RHEUMATIC OPHTHALMIA.

Syn.— Conjunctivo-sclerotitis.

Fig. London Medical and Physical Journal, April, 1827.

This compound ophthalmia is one of the most common, and also one of the most severe and dangerous diseases of the eye. In old persons especially, it is often the source of permanently diminished vision, and not unfrequently of entire loss of sight in the eye attacked.

Symptoms.—1. As both the conjunctiva and the sclerotica are affected, the symptoms are more complicated, and also more various, than those of unmixed conjunctivitis or sclerotitis.

2. The feeling of roughness or of sand between the eyelids and eyeball, and the secretion of puriform mucus, are sufficiently indicative of the part taken in this disease by the conjunctiva. The nocturnal accession of racking circumorbital pain marks the affection of the sclerotica.

3. In some cases of catarrho-rheumatic ophthalmia, the conjunctivitis is severe, the sclerotitis slight; but more frequently the sclerotitis is severe, and the conjunctivitis not so considerable.

4. In this disease, the conjunctiva and sclerotica are attacked simultaneously. Occasionally it happens in the course of pure rheumatic ophthalmia, that the patient, from some new exposure, becomes affected also with catarrhal conjunctivitis; more rarely does an attack of rheumatic sclerotitis supervene in catarrhal ophthalmia. But in catarrho-rheumatic ophthalmia, both membranes appear to be attacked at once, in consequence of the influence of one and the same exciting cause.

5. The redness is evidently both conjunctival and sclerotic. Under the moveable network of the conjunctiva, we perceive the immovable zonular inflammation of the sclerotica. In pure catarrhal ophthalmia, the sclerotica, no doubt, participates in the inflammation, but no paroxysms of rheumatic pain are present; the sclerotica suffers sympathetically, not primarily. In pure rheumatic ophthalmia, also, the conjunctiva is reddened, from contiguous sympathy with the structure which it covers, just as the skin is reddened over a joint suffering from acute rheumatism; but neither the conjunctiva in the one instance, nor the skin in the other, is the seat of the primary disease. Besides, in pure rheumatic ophthalmia, the conjunctiva betrays no marks of profluvial disease.

6. Chemosis, or inflammatory œdema of the subconjunctival cellular membrane, is by no means an uncommon attendant on catarrho-rheumatic ophthalmia. When it does occur, it hides from view the sclerotic redness.

7. The discharge from the conjunctiva in this disease is never

profuse, and seldom opaque. It amounts, in general, rather to a mere increase of mucus, than to a flow of pus, and renders the lids more than usually moist and slippery.

8. The eyelids adhere together in the morning, from the inspissated mucus and Meibomian secretion. Not unfrequently the lids are also externally red and swollen.

9. Considerable intolerance of light and epiphora attend this ophthalmia in all its stages; but especially in those cases in which the structure of the cornea is affected.

10. The conjunctival pain, which is compared to the feeling produced by sand between the eyelids and eyeball, is felt most in the morning, or when the eyelids are moved. The sclerotic pain is nocturnal, and observes the same periods of renewal, violence, and abatement, as in rheumatic ophthalmia. The conjunctival pain is referred to the surface of the eye, and sometimes to the forehead. The sclerotic pain is either immediately under the eyebrow, or circumorbital.

11. The cornea is extremely apt to suffer from ulceration, and from effusion of pus between its lamellæ. Indeed, there is no ophthalmia to which adults are exposed, in which ulcer of the cornea and onyx are so frequent as in the catarrho-rheumatic. If the disease is neglected for eight or ten days, and especially if the patient be far advanced in life, we almost uniformly meet with one or other, and not unfrequently with both of these symptoms.

12. The ulcer is generally peculiar, in so far as it is apt to spread over the surface, and rarely penetrates deeply into the substance of the cornea. It often seems the result of exfoliation of a considerable portion of the corneal epithelium. I have seen such a portion loose and raised up apparently by the intervention of a fluid. It must be this appearance which Beer describes as a phlyctenula; but it is more extensive than a phlyctenula, and is neither so circular nor so circumscribed. The ulcer which occurs in this ophthalmia, often cicatrizes without leaving any opacity, the cornea remaining merely irregular, as if part of it had been hacked off with the lancet; and vision, of course, from disturbed refraction, indistinct. If the case continues to be neglected, or if it be mistreated, the ulcer ceases to be superficial, the substance of the cornea is more deeply attacked, and a leucoma at least will be the result; but the cornea may even give way, allowing the aqueous humour to be evacuated, and giving rise to adhesion of the iris to the cornea.

13. Onyx, or effusion of pus between the lamellæ, or into the cellular texture of the cornea, is one of the most alarming of all the symptoms of this ophthalmia. It generally commences at the lower edge of the cornea, in shape like the white spot at the root of the nails, its upper edge presenting a convexity. It gradually increases, mounting upwards, separating more and more the lamellæ between which it is effused, and greatly adding to the sufferings of the patient. It reaches not unfrequently to such a height as to implicate more than half of the cornea. The pus of an onyx in catarrho-rheumatic ophthalmia is very rarely absorbed. The cornea becomes ulcerated over the centre of the onyx; the pus is evacuated; too often the

ulcer penetrates through the posterior lamellæ of the cornea; the aqueous humour escapes; the iris falls forward into contact with the ulcerated cornea; in nine cases out of ten these parts adhere together, and if much of the cornea has been destroyed, the result may be partial or total staphyloma.

14. At the same time that the onyx goes on advancing, the colour of the iris changes, and there is commonly an effusion of lymph into the pupil, which becomes, first of all, less vivid in its motions, then hazy and contracted, and at last perhaps obliterated.

15. In some cases, the onyx is accompanied by hypopium or effusion of pus into the anterior chamber, or we may have hypopium without onyx. In other cases, but very rarely, an onyx bursts into the anterior chamber; false hypopium is thus produced, and ultimately the cornea gives way.

16. If fortunately the matter of an onyx be absorbed, albugo remains for a considerable time, but gradually diminishes, and may ultimately almost entirely disappear. If the onyx is dispersed by the cornea giving way, leucoma is the result and never entirely disappears. Staphyloma cannot result, unless the cornea has been more or less destroyed by ulceration, and the iris has become partially or totally involved in the consequent cicatrice. Mr. Wardrop has remarked, that partial staphyloma generally affects the inferior half of the cornea.[1] The reason is, that partial staphyloma is commonly the consequence of onyx, which in nine cases out of ten takes place at the lower edge of the cornea.

17. In catarrho-rheumatic ophthalmia, the pulse is generally quick and sharp, the tongue white, and the mouth ill-tasted. The nocturnal pain completely prevents sleep, till about sunrise. Inflammation of the mucous membrane of the nostrils or the bronchi sometimes attends, and adds to the febrile symptoms.

18. We generally find that the rheumatic symptoms yield first to treatment; the catarrhal continuing for some days longer. But in some cases I have observed the reverse; the circumorbital pain continuing, at least in a certain degree, after the catarrhal symptoms were gone.

Causes.—The causes of catarrho-rheumatic ophthalmia appear to be similar atmospheric influences to those already enumerated as giving rise to catarrhal and rheumatic ophthalmiæ. Amongst the poor, the disease may, in general, be traced to cold, to which the patients have been exposed, particularly during the night, from deficient clothing and want of proper shelter. Like other inflammatory and rheumatic affections, it is more prevalent during north-easterly winds.

Beer thought that a cold draught of air (*eine kalte Zugluft*), playing upon the eye, excited rheumatic ophthalmia; and that foul air (*ein zersetzer verdorbener Luftkreis*) caused catarrhal ophthalmia. According to this view, air, at once corrupted and impelled with force against the eye, especially when the head is covered with perspiration, will be the most likely cause of catarrho-rheumatic ophthalmia.

That the discharge from the conjunctiva in catarrho-rheumatic ophthalmia, if applied to the conjunctiva of a healthy eye, will excite a puro-mucous conjunctivis, is extremely probable. We can be at no loss to distinguish catarrho-rheumatic ophthalmia from that stage of contagious conjunctivitis, in which the inflammation, spreading inwards to the deep-seated textures of the eyeball, excites sympathetic circumorbital pain.

We meet with catarrho-rheumatic ophthalmia much more frequently in old persons than in the young or middle-aged. I have never seen it in children.

Treatment.—The successful treatment of this disease does not depend so much on any new remedies, as on a proper selection of some of the means already recommended, either for the cartarrhal or for the rheumatic ophthalmia.

1. *Venesection* appears to be as necessary in the catarrho-rheumatic as in the pure rheumatic cases; and is attended by relief as remarkable to all the symptoms, especially to the circumorbital pain. According to the severity of the case, and the age and constitution of the patient, from 10 to 30 ounces of blood may be taken from the arm; and the same quantity on the day following, if the symptoms are not greatly relieved. We must not be deterred from depletion, although we find the patient much weakened and sunk by the pain attending the disease. The abstraction of blood, by removing the pain and thus affording an opportunity for rest, restores the strength and spirits.

2. *Leeches* to the temple are highly useful, particularly when applied soon after venesection.

3. *Scarification* of the conjunctiva of the eyelids, is to be employed when there is any considerable degree of chemosis.

4. *Calomel and opium* are productive of the same good effects in this ophthalmia as in the pure rheumatic.

5. *Opiate frictions* on the forehead and temple are to be used, about an hour before the expected attack of circumorbital pain.

6. *Belladonna* is to be applied, to keep the pupil dilated.

7. *Blisters* behind the ear or to the nape of the neck, are to be employed.

8. *Purgatives,* as a brisk dose of calomel and jalap at the beginning, and a gentle laxative every morning during the course of the disease, do good.

9. *Sudorifics,* as the solution of acetate of ammonia, with diluent drinks, the warm pediluvium, and a flannel under-dress, will be found useful.

10. *Tonics,* as sulphate of quina and the mineral acids, are to be given on the decline of the disease.

11. *Solution of nitras argenti.* As in the catarrhal, so in the catarrho-rheumatic ophthalmia, the solution of from 4 to 10 grains of nitras argenti in an ounce of distilled water, dropped upon the conjunctiva once or twice a-day, relieves the feeling of sand, and speedily removes the other symptoms of conjunctivitis. This application, however, has no effect on the sclerotic part of the disease. In this ophthalmia, I should consider it a very dangerous mistake to trust almost solely to this remedy, as we often do in pure catarrhal

inflammation of the eye, and thus neglect the appropriate means for reducing the attendant inflammation of the sclerotica.

12. *Vinum opii.* Before the catarrhal part of the disease is subdued by the solution of nitrate of silver, vinum opii rather aggravates the symptoms. After the conjunctivitis and the acute sclerotitis have yielded, it operates favourably, as in the chronic stage of the pure rheumatic ophthalmia.

13. The *collyrium muriatis hydrargyri,* 1 grain to 8 ounces, is to be used, tepid, three or four times daily, for bathing the eye.

14. The *unguentum præcipitati rubri* is to be smeared along the edges of the eyelids at bedtime. These two remedies are employed as part of the treatment suitable for the conjunctival part of the disease.

15. *Paracentesis corneæ — Opening abscess of cornea.* Puncturing the cornea, near its edge, so as to evacuate the aqueous humour, is likely to be highly advantageous, and may be employed when ulcer of the cornea is present, or even when there is an onyx; but the puncture should be made at a distance from the ulcer or abscess, and through a healthy part of the cornea.

As to direct interference with an onyx, my own experience would lead me to recommend that no attempt be made to evacuate with the lancet, the pus effused between the lamellæ of the cornea. The pus, being infiltrated into the spongy substance of the part, will not escape, although an incision be made. In every case in which I have made such an incision, partial or total staphyloma has been the result. When I have left the onyx to itself, the case has sometimes recovered beyond my most sanguine expectations. This I attribute to the natural tendency of the absorbents to remove deposits of matter or lymph, after the inflammation which gave rise to them has abated, aided by the sorbefacient influence of the calomel over the lymphatic effusion into the pupil, which always attends extensive onyx; to the continued use of belladonna; and to the gradual preparation of the cornea by nature for its giving way, and for its healing up — a preparation which must be entirely defeated when we venture to open the onyx with the knife. A very different view of this question has been taken by Mr. Guthrie, who advises the cornea to be laid open with a keen-edged cataract-knife, which, being introduced immediately below the edge of the interstitial abscess, is to divide the cornea, by a vertical incision extending to a like distance beyond the abscess. The internal opening in the cornea is to be made as large as the external one, thus allowing the aqueous humour and the matter of the abscess to be suddenly discharged, and the iris to fall or be pressed forward against the opening. After this operation, the eye is to be fomented frequently with warm water, and to be kept shut, and padded. Instead of a total loss of cornea, Mr. G. states that the result is the formation of a scar of limited extent.[2]

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[1] Morbid Anatomy of the Eye; Vol. i. p. 106; London, 1819.

[2] Medical Times, February 24, 1844, p. 363; March 9, 1844, p. 409.

SECTION XVII.—SCROFULOUS SCLEROTITIS.[1]

Syn.— Sclerotico-choroiditis. Sclerotitis attenuans. Cirsophthalmia.

Fig. Beck, Taf. VII. *fig.* 1. Demours, Pl. LXIII. *fig.* 1. Ammon, Thl. I. Taf. IV. *fig.* 21. Dalrymple, Pl. XX. *figs.* 1, 4, 6. Pl. XXIV.

That it is of importance to distinguish the disease which I am now about to describe, will appear evident, when we consider its dangerous nature. Its symptoms, as we shall immediately see, are very different from those of any other ophthalmia; and although ultimately the whole eye may be involved by inflammation commencing in the sclerotica, yet this variety of sclerotitis, in the early stage, exists without any signs which might lead us to suspect that a disease was before us, likely to involve, as it proceeded, the choroid and the iris, the cornea and the conjunctiva, and in fact the whole textures of the eyeball. I consider this variety of sclerotitis as completely a primary and distinct disease. At the same time, it must not be overlooked that it is apt to be superadded to other ophthalmiæ, and especially to scrofulous corneitis and iritis, and to syphilitic and arthritic iritis. I have seen it preceded by aphthous conjunctivitis.

The subjects of the present disease are generally adults, and more frequently females than males. If it is not entirely a scrofulous disease, those of scrofulous constitution are much more liable to it than others. I have very rarely seen it in children.

Symptoms.—1. *Redness.* One or more of the recto-muscular arteries are enlarged; and running towards the edge of the cornea, are seen to end there in a broad lash of small vessels. There is scarcely ever any general redness over the eyeball, or much inflammation of the conjunctiva. The portion of the sclerotica subjacent to the enlarged vessels, frequently presents, in the early stage of the disease, a pinkish blush, and by and by a thickened and fleshy appearance. The conjunctiva also appears thickened. It is probable that, even in this early stage, a preternatural adhesion takes place between the sclerotica and the choroid.

2. *Discoloration of the white of the eye.* If the disease is checked before any other symptoms manifest themselves than those already mentioned, the portion of sclerotica which was inflamed, frequently continues to appear thickened, and gradually assumes an opaque white colour; but if the disease proceeds, the exterior tunics of the eye become softened and attenuated, so that the choroid shows its dark colour through the sclerotica, which therefore appears blue or purplish. This is one of the most remarkable symptoms, and takes place in many cases at a very early period of the disease, the blueness shining obscurely through the inflamed sclerotica and conjunctiva. We often observe one part of the sclerotica thickened and loaded with enlarged vessels, and another part thinned so as to allow the choroid to shine through. The degree of discoloration is different, according to the severity and duration of the attack, being at the early stage merely perceptible on comparing the diseased with the healthy eye, or the diseased side of the eye with the healthy side, while in advanced cases it amounts to a deep blue. About the eighth of an inch behind the edge of the cornea is the most frequent situa-

tion of the discoloration, which generally occupies only a portion of the circumference of the eye, but is very apt to go round the cornea completely. It is at first narrow in extent, but afterwards becomes broader, both approaching the cornea anteriorly, and stretching backwards over the sclerotica.

3. *Sclerotico-choroid staphyloma.* After continuing for a time discoloured merely, the part affected protrudes. The sclerotica and choroid having in general become preternaturally adherent, and being softened in their texture from the inflammation they have undergone, lose their supporting power. Atrophied and thinned, they cannot sustain the contents of the eyeball, but give way and become protruded. As the previous redness and consequent thinning of the sclerotica commonly occupy only one side of the eyeball, so does the protrusion in question. The protrusion is generally near the cornea, as if the corpus ciliare was the seat of the disease, and more frequently above, or to the temporal side of the cornea, than below or to its nasal side. In some cases, there is only one protrusion, which may enlarge to the size and prominence of a filbert; in others, a ring more or less complete (*fig.* 54.), or numerous tumours, of various sizes, closely surround the cornea; while, in a third set, the whole eye is enlarged, and the sclerotica attenuated in its entire circumference. Such tumours, or protrusions of the choroid have received the names of *cirsophthalmia, varicositas oculi, hernia choroideæ, staphyloma corporis ciliaris*, and *staphyloma scleroticæ.* They generally present numerous varicose vessels ramifying over them.

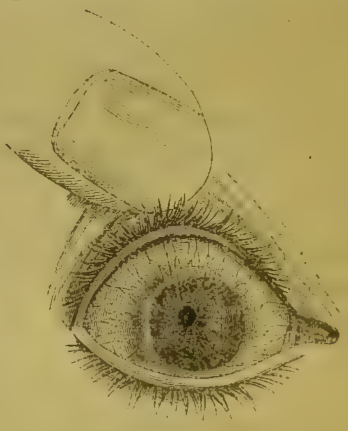
Fig. 54.

The front of the eye, however, is not the only seat of staphyloma of the sclerotica and choroid. Scarpa tells[2] us, that he had never met with any tumour or elevation of the sclerotica on its anterior surface, resembling a staphyloma; but that he had twice happened to meet, in the dead body, with staphyloma of the posterior hemisphere of the sclerotica.

The first time was in the eye of a woman of 40 years of age. The eye was of an oval figure, and upon the whole, more voluminous than the sound eye on the other side. On the posterior hemisphere of the diseased eye, and to the external or temporal side of the entrance of the optic nerve, the sclerotica was elevated in the form of an oblong tumour, like a small nut. As the cornea was sound and pellucid, and the humours still preserved their natural transparency, on looking through the pupil, there appeared towards the bottom of the eye, an unusual brightness, produced by the light penetrating that part of the sclerotica, which had become thin and transparent where it was occupied by the staphyloma. When the eye was opened, the vitreous humour was found entirely disorganized, and converted into limpid water, and the crystalline lens somewhat yellowish, but not opaque. When the posterior hemisphere of the eye was immersed in spirit of wine, with a few drops of nitrous acid added to it, in order to give the retina consistence and opacity, it was distinctly perceived that there was a deficiency of the nervous expansion of the retina within the cavity of the staphyloma; that the choroid was very thin at this part, deprived of its natural colour, and of its usual vascular network; and that the sclerotica, particularly at the apex of the staphyloma, was so thin as scarcely to equal the thickness of writing paper. The woman from whom this eye was taken, had lost the faculty of seeing on that side some years before, during an obstinate ophthalmia, attended with severe pain in the head.

Scarpa had an opportunity of making similar observations on an eye met with accidentally by Monteggia. It was taken from a woman, 35 years of age, was of an oval figure, and longer than its fellow. The staphyloma was situated exactly as in the former instance. The vitreous humour was dissolved; the crystalline capsule was distended by a thin whitish fluid; the lens yellowish, and less than natural; the retina deficient within the staphyloma; the choroid and sclerotica, forming the tumour, thinned, so as to transmit the light. Nothing positive could be ascertained regarding this woman's sight.

4. *Effusions of aqueous fluid within the eyeball.* That the vessels of the choroid are sometimes greatly enlarged in this disease, does not admit of doubt. At the same time, the distension which the choroid and sclerotica suffer, is seldom owing to any thickening of the former coat, or to any varicose distention of its blood-vessels, but is often connected with an effusion of watery fluid within the eyeball. I have already stated the probability that, even in the early stage of the disease, a preternatural adhesion takes place between the sclerotica and choroid. On extirpating staphylomata of these tunics, I have found them firmly adherent to each other, and I think it likely that this is generally the case. At the same time, it has been ascertained by dissection[3] that a watery fluid is sometimes present in sclerotic staphyloma between the sclerotica and the choroid, whereby the latter tunic is pressed inwards and the former outwards. There are also good grounds for believing that a similar effusion forms occasionally between the choroid and the retina. If the fluid collected in the latter situation is not evacuated by puncturing the staphyloma, it may accumulate to such a degree as to press the retina before it, and having at last produced, by means of its continued pressure, an absorption of the vitreous humour, it will gather the retina into a cord, as sometimes happens in arthritic and in mismanaged cases of syphilitic ophthalmia. A third situation of the hydrophthalmic effusion is between the retina and the hyaloid. Perhaps within the hyaloid is as frequent a seat of the watery effusion as any other; and in this case the structure of the vitreous body is broken up and dissolved.

5. *Displacement of the pupil.* Although the iris is seldom affected with inflammation in this disease, the pupil, in many of the cases which I have witnessed, underwent a remarkable change of place. The iris is always narrowed towards the portion of the sclerotica which is affected, and in many instances the pupil is observed to have moved so much out of its natural situation, as to be almost directly

behind the edge of the cornea. Upwards, and upwards and outwards, are the directions in which the pupil is most frequently observed to become displaced. It occasionally continues small and moveable, in other cases it is immoveable, but not dilated; in very severe cases it is greatly enlarged, the iris having entirely disappeared at that part of its circumference towards which the displacement of the pupil has happened.

The remarkable displacement of the pupil which attends scrofulous sclerotitis is owing probably to some affection of the ciliary or iridal nerves, which, running forward between the sclerotica and the choroid, pass through the orbiculus ciliaris or ciliary muscle, and ultimately reach the iris. Displacement of the pupil has been remarked by Beer, as an attendant on syphilitic iritis. That it is not a constant attendant is well known. I have seen it in other varieties of iritis. It has never been attributed to any affection of the choroid, nor has any explanation of its cause been offered.

The pupil does not return to its place, even although the other symptoms are subdued.

We sometimes observe the iris, in cases of scrofulous sclerotitis, of a slate colour, and bulging towards the cornea, while the pupil is more or less filled with lymph, and adherent by its margin to the capsule of the lens. These changes denote the previous existence of iritis; they often become complicated with cataract.

6. *Opacity of the cornea* is not a necessary, although a frequent attendant on scrofulous sclerotitis, and may occur in the first stage of the disease, along with the thickened and opaque state of the sclerotica, although generally later. It is the edge of the cornea nearest to the portion of affected sclerotica, which becomes opaque, so as to resemble part of a broad arcus senilis, or as if the sclerotica were intruding on the cornea, the rest of the cornea remaining perfectly clear. In other cases, there are pretty extensive, but very irregular spots of whiteness, more the effect apparently of interrupted nutrition than of inflammation. In some cases, I have observed the cornea smaller than natural, but more frequently, as the disease advances, it not only becomes almost quite opaque, but partaking in the staphylomatous degeneration of the neighbouring tunics, it even undergoes a degree of dilatation, so as to become considerably broader and more prominent than in its natural state, and scarcely distinguishable from the attenuated sclerotica. (*Fig.* 55.) In this state of the cornea, its epithelium is apt to become thickened, and loosened from the anterior elastic lamina, so as to cause the feeling as if a foreign body were in the eye. From the changed condition of the cornea alone, independently of the interior changes of the eye, the patient's vision may be almost or altogether lost. *Figs.* 54. and 55., represent the eyes of a young woman, a patient of the Glasgow Eye Infirmary.

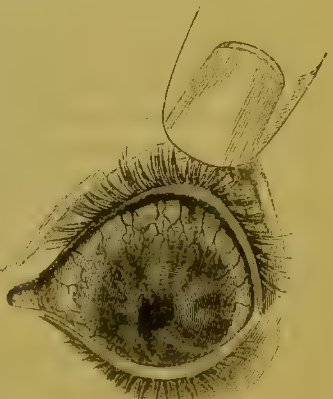

Fig. 55.

In the right eye, the disease formed a staphyloma of the sclerotica and choroid, around the temporal half of the cornea; in the left eye, the whole eye, including the cornea, partook of the staphylomatous degeneration.

7. *Exophthalmos and exophthalmia.* In consequence of scrofulous sclerotitis, the eye may enlarge so much as to protrude from the orbit to a very considerable degree. After a time the eye, in this state of exophthalmos, is apt to suffer external inflammation, from being but imperfectly protected by the lids, from being perpetually fretted by the loose epithelium of the cornea, or from cold or mechanical injury. This condition of the eye may be alleviated by its being punctured, either through the cornea or through the sclerotica; but if this is neglected, the inflammation may run to a great height, the conjunctiva become chemosed, and puriform fluid be deposited behind the cornea, or between its lamellæ; the eye may burst, assume a fungous appearance, bleed profusely, and being productive of great pain and deformity, although entirely free from any malignant degeneration, require to be extirpated.

8. *Intolerance of light* and *epiphora* generally attend this disease, in a considerable degree.

9. *Pain.* This varies much in different individuals. When there is as yet no protrusion, the pain is generally moderate; but sometimes considerable, and supra-orbital. When the sclerotica is much distended, and especially when this takes place suddenly, and is attended with considerable increase of redness, the pain in the eye becomes severe, and sometimes furious. Hemicrania is also present, affecting principally the top of the head, the high part of the temple, and the cheek. It is not strictly circumorbital, nor is it strikingly nocturnal. The patient complains of stupor and giddiness on stooping or turning quickly, and on any sudden transition from light to darkness, or from darkness to light.

10. *Vision* is variously affected in scrofulous sclerotitis. In some instances, the very first symptom is dimness of sight. The patient generally complains of photopsia, of the eye being dazzled, and not unfrequently of iridescent vision. Hemiopia, all objects to one or other side of a vertical line, or above or below a horizontal line, appearing dim, all objects appearing confusedly, and as if double, even when viewed with one eye, are symptoms which not unfrequently distress the patient long before the redness or blueness of the eye attracts attention. If the disease goes on, we sometimes find that total blindness ensues, even when the eyeball appears but partially affected; while in other cases the whole organ is evidently enlarged and discoloured, and yet a considerable degree of vision is retained.

Stages of the disease.—From the preceding account of the symptoms, the reader will perceive that the disease presents three stages. In the *first*, the sclerotica appears inflamed, thickened, and opaque; in the *second*, it is thinned, so that the choroid shines through it; in the *third*, these tunics are protruded, and the eye hydrophthalmic.

Constitutional symptoms.—1. Various degrees of febrile excitement attend scrofulous sclerotitis. In the early stage, before distention brings on acute pain, the pulse is not affected; after the patient has suffered much, a cachectic state is apt to follow, with quick pulse, pale or sallow complexion, excessive nervous irritability, and great general weakness. The patient is inactive, complains of coldness of the extremities, and evidently labours under a deficient cutaneous circulation.

2. The digestive organs are frequently much deranged, even from the very first. Want of appetite, frequent acidity of stomach, costiveness, flatulence, and foul tongue, attend the disease in many instances.

Remote and exciting causes.—I have been led to ascribe the commencement of scrofulous inflammation of the sclerotica to such causes as the following: —

1. Want of exercise; too much confinement within doors.
2. Derangement of the stomach and bowels.
3. Over-use of the eyes, in reading, sewing, miniature-painting, and other minute works.
4. Exposure to too much heat and light, and especially to the glare of hot fires, and to sudden changes from heat to cold.
5. Penetrating wounds and blows on the eye, falls on the head, and other injuries.
6. Depressing affections of the mind; and, in females, a scanty and irregular state of the menstrual secretion.

Prognosis.—Recovery is always slow. If the disease has gone to any considerable length, it is scarcely ever completely removed. The vestiges of it are in general permanent, even after it has been completely checked in its progress. In many cases, we may reckon ourselves fortunate, if we arrest the disease. Yet it sometimes happens that the cure proceeds to a degree beyond our expectation. I attended a gentleman who, many years before, had lost all useful vision in the left eye from this disease. The right was now attacked. Both pupils were greatly displaced; the visible arteries of the right eye were much dilated, and the sclerotica at different places considerably attenuated; the left eye was enlarged, of a pretty deep blue colour, and a great part of the cornea opaque. By blood-letting, counter-irritation, and other remedies, the disease was arrested in the right eye, and very unexpectedly the left eye recovered to such a degree, that he was again able to read with it an ordinary type. Many relapses, in the course of twenty years, ultimately destroyed both eyes.

Treatment. — 1. *Blood-letting* does more good in the early stage of this disease, than all other remedies put together. Yet we might perhaps not be tempted to bleed at this period of the disease, from the circumstance that in many instances there are no external signs of intense inflammation, and the patient does not suffer any acute pain. The practitioner, therefore, who is not acquainted with the nature and symptoms of this ophthalmia, might be apt to trifle away time in the application of a few leeches, when he should be opening the temporal artery, and removing a large quantity of blood. I have known the blueness and evident distention of the sclerotica, which, notwithstanding leeching and other remedies, had continued unabated for many weeks, disappear suddenly and completely, after the loss of 20 or 30 ounces of blood from the temple. Bleeding from the jugular vein, or from the arm, is also highly useful. Twenty-four or more leeches round the eye, every second day, I have seen attended by the best effects.

In chronic cases, we must not neglect the frequent and liberal application of leeches. In the repeated and often severe attacks of pain which occur in the course of the chronic stage, if the pulse is not affected, blood taken from the arm is not buffy, and venesection does little good.

2. *Purgatives* are of essential service. The disordered state of the biliary and other digestive organs, indicates the use of calomel as a cholagogue, followed by salts and senna, or some other brisk purgative. Such remedies are to be repeated frequently, during the course of the treatment. In some cases, *emmenagogues* are particularly indicated.

3. *Vapour-bath.* Every means must be adopted likely to equalize the circulation, remove the coldness of the feet, and bring on cutaneous perspiration. One of the most useful remedies for this purpose is the vapour-bath, every second night.

4. *Mercury.* We are naturally led to advise mercury in this disease, from observing its happy effects in iritis. In some rare instances, it has been attended with evident advantage. The form in which I have found it most useful is the blue pill combined with aloes. This combination purges pretty smartly at first, but soon touches the gums. On the whole, however, I must confess that I have seldom witnessed any remarkable benefit, either from making the mouth sore, or from small doses long continued. I have used this medicine both in friction round the orbit, and in various forms internally; but it has, in most cases, appeared to be of no avail.

5. *Iodide of potassium,* as a remedy possessing great power over the fibrous membranes, is likely to be of advantage. I have known it prove highly beneficial, both in the first and second stages of the disease.

6. *Tonics.* After due depletion, I have seen much benefit accrue from the precipitated carbonate of iron, and the sulphate of quina. They may be given separately, or together.

7. *Arsenious acid — Arseniate of potass.* Under the influence of these preparations, I have had the satisfaction, in a number of instances, to observe the varicose vessels shrink, the discoloration and tumour of the sclerotica and choroid diminish, and the patient's vision and health improve. The dose with which I have generally commenced, is the 32nd part of a grain, thrice a-day, in the form of pill.

8. *Counter-irritation* is decidedly useful. A tartar emetic eruption betwixt the shoulders is perhaps the most effectual.

9. *Belladonna,* in the form of extract, applied to the eyelids in the usual manner, or the *sulphate of atropia,* in solution, dropped on the eye, is of service.

10. *Paracentesis oculi.* Puncturing the sclerotica and choroid, so as to evacuate the fluid collected within the eye, is a remedy of much importance in the treatment of this disease. It is not to be employed in

the acute stage, at least I have not dared to try it except in chronic cases, and where there was an evident commencement of choroid staphyloma. The operation is performed with the extraction-knife or with a broad cataract needle, thrust, not in the direction of the lens, which it might readily wound and render opaque, but towards the centre of the vitreous humour. The instrument need not penetrate deeper than the eighth of an inch. A little blood is usually discharged, along with aqueous fluid of a slightly glutinous consistence. The operation, though sometimes followed by considerable pain and constitutional disturbance, generally gives great relief to the feeling of distention or pressure in the eye, and to the attending headache. It may be repeated every eight days, or at longer intervals, according to the state of the eye.[4]

When the cornea is much dilated, and its epithelium loose, it should be punctured from time to time, so as to evacuate the aqueous humour.

11. *Stimulants.* Although local applications are not of much use in scrofulous sclerotitis, I have witnessed good effects, in the early stage, from the employment of the collyrium of bichloride of mercury, and the solution of nitrate of silver.

12. *Partial or total extirpation of the eye.* Choroid staphyloma, from its size and prominence, may demand extirpation, merely the tumour being removed and the rest of the eye left. The dark aspect of the tumour sometimes gives rise to a suspicion, that the interior of the eye is the seat of melanosis or some other malignant growth. If the case is one of choroid staphyloma, a puncture of the eye, by giving exit to a large quantity of fluid, settles the question. The whole eyeball in one case being enlarged and projecting from the orbit, so much that it could with difficulty be covered by the lids, I passed a ligature through it from the temporal to the nasal side. There immediately drained away a large quantity of aqueous fluid, the coats became flaccid, and I easily snipped off with the scissors the anterior half of the eye. In other cases, I have removed a lateral portion, sometimes nearly a lateral half, of the dilated eyeball. Total extirpation will seldom be necessary in choroid staphyloma, however general it may be, and however much the eye may be protruded.

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[1] To the disease which forms the subject of this Section, I formerly (Glasgow Medical Journal for February, 1830, p. 1.) gave the name of choroiditis. In the second edition of the present work, from the prominent part which the sclerotica takes in the disease, I changed the name to sclerotico-choroiditis. Further consideration has led me to transfer the name choroiditis to a ifferent affection.

[2] Trattato delle principali Malattie degli Occhi; Vol. ii. p. 146; Pavia, 1816. On staphyloma posticum, consult Ammon, Zeitschrift für die Ophthalmologie; Vol. ii. p. 247; Dresden, 1832.

[3] Ammon, Op. cit.; Vol. ii. p. 252; Vol. v. p. 364; Heidelberg, 1836.

[4] Martland, Edinburgh Medical and Surgical Journal; Vol. xxiii. p. 59; Edinburgh, 1825: Lechla, Ammon's Zeitschrift für die Ophthalmologie; Vol. ii. p. 336; Dresden, 1832.

SECTION XVIII. — CORNEITIS.

Syn. — Keratitis.

Although the cornea, in its fully developed and healthy state, is a non-vascular part, yet it suffers frequently and severely from inflammation. Its anterior elastic lamina and epithelium, its lamellated or proper tissue, and its lining membrane, are all of them liable to be affected by inflammatory changes. When any cause capable of exciting inflammation acts especially on the cornea, congestion takes place in the surrounding conjunctiva and sclerotica, and in the anastomatic wreath placed close to the edge of the cornea, and which is derived from the blood-vessels of those tunics. Exudation manifests itself, at the same time, in the cornea itself, affecting most frequently the exterior lamellæ, sometimes the proper substance, and occasionally the lining membrane, and always imparing the transparency of the part. By and by, blood-vessels are developed in the exuded matter, and then the cornea becomes red. The disease proceeding, ulterior changes, such as suppuration, ulceration, and even gangrene, may take place.

Injuries, such as those of which we have already spoken (pp. 229, 386), are a very frequent cause of inflammation of the cornea; and the more severe of them are often followed by total suppuration and disorganisation of its structure. This result is also, unfortunately, a too common consequence of the wound of the cornea, made in extraction of the cataract.

In most of the ophthalmiæ already considered, the cornea is liable to suffer more or less directly. In the acute stage of the puro-mucous ophthalmiæ, the chief danger arises from the cornea participating in the inflammation, so that it becomes infiltrated with pus, or destroyed by ulceration; while, in the chronic stage, the irritation caused by the granular state of the palpebral conjunctiva, produces a vascular and nebulous state of its surface. The cornea is a common seat of the phlyctenulæ which attend scrofulous conjunctivitis; and often in this disease it is penetrated, layer after layer, by ulceration. In post-variolous ophthalmia, the formation of an abscess in the cornea is one of the most remarkable symptoms, and often leads to the loss of vision. In catarrho-rheumatic ophthalmia, as I have explained in Section XVI., the cornea is exceedingly apt to become ulcerated on its surface, or infiltrated with pus. I have also had occasion repeatedly to refer, in the preceding pages, to instances of adhesive inflammation of the lining membrane of the cornea. Various inflammations, then, of this part of the eye have already come before us, which we might arrange under the heads, *external, parenchymatous,* and *internal,* according to their seats. But the inflammation of the cornea to which we have now to attend, is specifically different from every other ophthalmia. It is neither a puro-mucous, nor an eruptive affection. Its development and progress are slow, occupying weeks, months, or years. The superficial layers appear to be chiefly affected in this disease; which, however, may extend to all the tissues of the cornea, and involve other parts of the eye, as the iris, the crystalline capsule, the choroid, and even the retina.

According to the majority of ophthalmological authors, inflammation of the cornea is either greatly promoted by weakness of constitution, or occurs much more frequently in scrofulous, than in other subjects. "It is most frequent in the young," says Mr. Lawrence[1], "and seldom seen after the middle period of life. It occurs in those of unhealthy constitutions, especially the strumous; or where the general powers have been considerably reduced." "I do not recollect," says Mr. Tyrrell[2], "to have seen a single case, of pure corneitis, in a subject possessing a proper degree of general power." "It must be admitted," says Mr. Walker[3], "that strumous subjects are most frequently attacked with the disease." Hence, the disease, as it occurs in young subjects, is often designated as *scrofulous corneitis*. It would be difficult, indeed, to describe *idiopathic corneitis*, except only by representing the symptoms as being attended by somewhat less suffering from pain and intolerance of light, and as running generally a more acute course, than in the scrofulous or common variety. We also meet with cases of corneitis in old persons, in whom the symptoms are either distinctly modified by the gouty diathesis, or present such local appearances as vindicate their being distinguished by the term *arthritic*.

§ 1. *Scrofulous Corneitis.*

Syn. — Keratitis scrofulosa.

Fig. Froriep de Corneitide Scrofulosa. Ammon, Thl. I. Taf. III. *figs.* 1, 2, 3, 18, 19. Dalrymple, Pl. XVI. *fig.* 1. Sichel, Pl. VI. *fig.* 2. Pl. VII. *fig.* 5.

Symptoms.—1. The redness is principally in the sclerotica and on the surface of the cornea. The sclerotic redness is in general not very considerable, of a lake colour; the vessels very minute, and arranged in scattered radii round the cornea. Not unfrequently there is a reddish ring, seldom complete, often in the shape of a crescent, somewhat elevated, formed around or upon the edge of the cornea, while other red vessels, more or less numerous, are prolonged over its surface to its centre. In some cases the whole cornea is so much covered, that it assumes a red colour, and has been compared, in this state, to a piece of red cloth; a symptom which has therefore been styled *pannus*. This is generally an evident result of increased vascularity; but, in some cases, it bears a resemblance to an ecchymosis, till it is examined with a magnifying-glass, when the red patch is seen to resolve itself into innumerable vessels. In chronic cases, the blood-vessels derived from the recti muscles, and which are visible during health, are much dilated, and extend over the cornea.

2. The cornea is more or less opaque and rough, its epithelium, and probably its anterior elastic lamina, being thickened and changed in texture. The roughness frequently resembles the dotting which might be produced by touching the surface of the cornea all over with the point of a pin; in other instances, the depressions are somewhat larger. In every case, we find that the surface of the cornea has lost its natural polish; and from this circumstance, even when no great opacity is present, the eye appears dull, resembling a glass that

has been breathed upon, and vision is indistinct. Dimness of sight and slight opacity are the earliest symptoms of the disease. They are often present without any perceptible increase of vascularity. In some instances, the opacity amounts to haziness only; in others, it consists of a streaked or speckled whiteness, arising from depositions of coagulated lymph, with interstices of clear cornea. Not unfrequently the surface becomes completely and almost uniformly white, one patch of opaque deposition taking place after another, or the opacity creeping slowly from one or other edge of the cornea over to the opposite edge, and thus affecting its whole extent. As the disease subsides, the cornea often presents a greenish hue. Here and there we occasionally observe upon it elevated points of a yellowish colour, which rarely suppurate or ulcerate. I have sometimes seen deep ulceration in corneitis. This was the case in a lad who became violently affected with the disease while at sea, and in whom the whole cornea was red, of a conical form, and presented at its centre a white sloughy ulcer.

Although it is generally the superficial laminæ which are affected with haziness or opacity, we sometimes see the inner laminæ opaque, while the surface is pretty clear. I do not mean that the internal elastic lamina, or membrane of Descemet, is spotted with minute opacities, as in aquo-capsulitis; but that apparently between that membrane and the proper substance of the cornea, there is a pretty extensive and irregular opaque deposition. We sometimes see this appearance in the one eye, while the other presents an affection chiefly of the superficial laminæ. Although the external surface clears, such deep-seated opacities scarcely ever disappear.

3. In most cases of scrofulous corneitis which have lasted a considerable time, we find the cornea more convex than natural, and the aqueous humour superabundant; or in other words, there is a degree of *hydropthalmia.* In some instances, the cornea becomes somewhat conical; and we often observe the whole eyeball to partake in the conical form, along with an attenuation of the anterior part of the sclerotica, so that the choroid shines through of a blue colour, an approach to staphyloma of the corpus ciliare. Common staphyloma of the cornea and iris rarely, if ever, results from corneitis. The cornea, from its conical form and its great opacity, sometimes bears a resemblance to such a staphyloma; but as the symptoms subside, the iris is seen to be unconnected with the cornea.

Not unfrequently we meet with the cornea of a blunt conical form, the centre presenting a white spot, while the rest of its extent is quite red, or in the state of pannus. As the disease proceeds, the white spot ulcerates, and then the pannus begins to clear; the iris and the pupil come gradually into view, and a cure, more or less perfect, is accomplished. In such cases, it generally happens that, till the central opaque spot ulcerates, no improvement is effected. Such cases are apt to leave the cornea considerably reduced in size, or in other words, partially atrophied.

Proper conical cornea sometimes, but very rarely, results from corneitis, the conical form being assumed as the nebulousness subsides.

4. Dilatation of the pupil not unfrequently attends corneitis, and

in many cases, there is reason to suspect a tendency to amaurosis. But in other instances, the inflammation extends from the cornea to the iris; and when this is the case, the pupil becomes contracted, and may even, from effusion of coagulable lymph, adhere to the capsule of the lens. In many cases of corneitis, it is difficult to recognise the state of the iris and pupil, through the hazy or speckled cornea. Considerable assistance will be derived, under such circumstances, from concentrating the light upon the surface of the cornea, by means of a double convex lens, and by observing the effect produced by the application of extract of belladonna to the surface of the eyelids, or the instillation of a solution of sulphate of atropia.

5. There is not, in general, any great degree of intolerance of light in this disease; scrofulous corneitis presenting in this respect a striking contrast to phlyctenular conjunctivitis. This symptom, however, is variable; for in some cases, especially those attended with pannus, the patient cannot bear the light, and there is considerable epiphora.

6. In general, there is little or no pain, except perhaps in the commencement of the complaint. It sometimes happens, however, that very acute pain is experienced in the eyeball, coming on in paroxysms; this may be the case, although there is no inflammation of the iris present. After a time, the eye falls into a chronic indolent state of inflammation, unattended by pain, especially after the whole cornea has become opaque.

7. The pulse is quickened, the patient is restless in the night, and the skin is commonly harsh and dry. The extremities are often habitually cold.

8. The subjects of scrofulous corneitis are, in general, from 8 to 18 years of age; and in the female the complaint frequently appears in connection with amenorrhœa. In the female as well as in the male, the skin of those affected with corneitis is often coarse and flabby, with the sebaceous follicles of the face much developed, and I have, in many instances, observed it coincident with deafness and a peculiar hoarseness of voice. In more than one case, I have witnessed this disease along with total deafness. In one of them the deafness occurred a week or two before the corneitis. Other scrofulous symptoms are generally present, especially swollen lymphatic glands under the jaw; not unfrequently nodes on the tibiæ, sometimes effusion into the bursa under the tendon of the extensores cruris.

Causes.—The occasional causes of scrofulous corneitis are often obscure. I have known it arise from exposure during the night to the glare of flambeaux, from over-exertion of the eyes, and from want of sleep. Slight injuries, such as the intrusion of a gnat into the eye, may produce it. In many cases it is attributable to exposure to cold and wet.

As it is well known that division of the fifth nerve in brutes produces inflammation, opacity, and ulceration of the cornea, it becomes a question how far corneitis in the human subject may not occasionally depend on some morbid affection of that nerve. The experiment shows how inflammation may be brought on by suspending the nervous influence communicated to a part.

In one case, which came under my care, in which the pain was excessively severe, the patient recovered perfectly from the corneitis, but died not long after, from disease in the head. Scrofulous tubercles were found at the basis of the brain, pressing on one of the optic nerves.

Prognosis.—Corneitis, even in its mildest form, is always tedious, and in its consequences generally dangerous to vision. The amount of recovery however, in consequence of the gradual absorption of opaque depositions, is often wonderful, even when little or nothing was expected. In this way, vision may be perfectly regained. On the other hand, it is often permanently deteriorated, being rendered myopic by change of figure in the cornea, limited by indelible opacities, and affected by the deeper-seated changes owing to implication of the iris, the capsule of the lens, or the retina. The prognosis must always depend, in a great measure, on the prospect we have of improving the general strength of the patient. It is proper, in every case, to state that amendment will be slow.

General treatment.—1. *Depletion* may, perhaps, appear to be but seldom indicated, at least by any urgency of pain, or signs of active inflammation. Yet we find considerable advantage from the application of leeches in the neighbourhood of the eye, especially if they are had recourse to early in the disease. When the inflammation affects the proper substance of the cornea, and not merely its superficial laminæ, and the patient complains of pain or tension in the eye or across the forehead, leeches are necessary. If there are violent paroxysms of pain, venesection must be employed. Local bleeding ought to be repeated from time to time; but not so frequently as to reduce much the general strength.

2. *Emetics* and *purgatives* are also useful. They are to be employed according to the directions laid down at page 490.

3. *Tartar emetic*, as a sedative and alterative, I have found decidedly advantageous, both by itself in doses of from the 12th to the 4th of a grain thrice a-day, and along with Peruvian bark, or sulphate of quina. This combination is no doubt unchemical; but I have certainly derived more benefit from these two medicines given together, than from either of them singly.

4. *Diaphoretics* are indicated by the dry and harsh state of the skin. Tartar emetic will operate favourably on the skin, and may be assisted by the warm pediluvium, and Dover's powder, at bedtime.

5. *Mercury*, carried to such a length as to touch the gums, is of great service in the treatment of this disease. When there are severe paroxysms of pain, mercury should be promptly administered; else the pupil may contract morbid adhesions; but in general, this remedy is not to be commenced till the acute symptoms have been removed by depletion of different kinds, and the employment of tartar emetic in small doses. When the mercury begins to act decidedly on the constitution, we generally find that the enlarged vessels on the cornea contract, and the newly deposited matter becomes absorbed. The clearing of the cornea commences around its circumference, the favourable change slowly advancing towards the centre. The best form in which to administer mercury in this, as in some of the former ophthalmiæ, is calomel with opium. Mercury is peculiarly

necessary in those cases which are attended with iritis, and in them ought to be employed from the first.

6. *Sulphate of quina* exercises an influence over scrofulous corneitis, slower of manifestation, but in the end not less beneficial, than that which the same medicine displays in phlyctenular ophthalmia. I have treated many cases with this remedy alone. Violent cases, however, will not yield to it, but require depletion, and mercury. A combination of sulphate of quina with a purgative, such as the compound colocynth pill, often proves highly useful. When we find the patient, on our being called in, affected with great debility, flabbiness of the skin, and night-sweats, it may be proper to put him on sulphate of quina from the first. I have treated many cases with a mixture of calomel and sulphate of quina.

7. *Turpentine,* in doses of from half a drachm to a drachm thrice daily, has been found beneficial.[4]

8. *Vegetable alteratives* and *tonics,* as colchicum, sarsaparilla, elm bark, and bebeerine, are useful remedies in scrofulous corneitis, although inferior to cinchona and sulphate of quina. I have witnessed excellent effects from frequent small doses of columba, rhubarb, and supercarbonate of soda, in this disease. Aconite, and belladonna, given internally, prove useful, especially when there is much pain, intolerance of light, and epiphora.

9. *Cod liver oil,* and preparations containing *iodine,* and especially the *iodide of potassium,* may be given with advantage, when, from debility or other causes, we deem it prudent to refrain from the exhibition of mercury.

10. *Muriate of barytes* is strongly recommended by Ammon. *Arsenic* has sometimes been employed. Whatever remedy is selected, it must not be soon abandoned, although slow in manifesting beneficial effects. Many cases are under treatment for a whole year, or even longer, before they perfectly recover.

11. The cure is greatly promoted by good nourishment, warm clothing, pure air, and regular exercise.

Local means of cure. 1. *Warm fomentations* with poppy decoction, or with a warm infusion of belladonna leaves or extract, and exposing the eyes to the vapour of hot water and laudanum, give great relief in those cases in which the presence of light proves irritating.

2. *Collyria,* such as have already (p. 496) been recommended for phlyctenular ophthalmia, are to be employed also in corneitis, and especially the collyrium of the bichloride of mercury with belladonna.

3. *Blisters* and *issues* on the neck, behind the ear, and on the temple, are useful and generally necessary. A tartar emetic eruption is often of great service.

4. *Hydrocyanic acid,* applied in the form of vapour, proves decidedly useful, when the acute stage is over; its influence evidently lessening the redness and clearing the cornea. Immediately after the eye is exposed for a few minutes to the vapour, it is advantageous to drop upon the eye, the solution of nitrate of silver of the strength of from 4 to 10 gains to the ounce of distilled water, and to paint

the eyelids with the extract of belladonna. I have known these three remedies to act very beneficially together.

5. *Stimulants.* I have tried many different remedies of this class. They are admissible, only after the symptoms of acute inflammation have been subdued, and the disease has fallen into the indolent stage. On the whole, most advantage appears to be derived from vinum opii, used once a-day. Next to vinum opii, I would place strong red precipitate salve. About the bulk of a split pea is to be introduced daily between the lids and the eyeball, and then carefully rubbed upon the surface of the cornea through the medium of the upper lid. From half a drachm to a drachm of red precipitate, triturated along with an ounce of white sugar into an impalpable powder, and a small quantity blown into the eye through a quill, is another mode of applying the same substance. The lunar caustic solution, applied in the usual way, and a solution of 4 grains of sulphate of zinc in an ounce of water, injected over the surface of the eye, are attended with good effects. Very evident advantage is sometimes derived from employing, in the course of the 24 hours, more than one of these stimulants; for example, vinum opii in the morning, and red precipitate salve at bedtime.

6. *Belladonna* extract is to be painted on the eyebrow and eyelids, or a solution of sulphate of atropia dropped upon the eye, every evening, for dilating the pupil, when there are either evident symptoms, or even only a suspicion, of inflammation of the iris.

7. *Evacuation of the aqueous humour* appears to be indicated in those cases in which there exists a tendency to hydrophthalmia. Jüngken recommends it highly.[5]

§ 2. *Arthritic Corneitis.*

Syn.— Keratitis arthritica.

In elderly people, and especially in subjects who have suffered from gout, we occasionally meet with corneitis, characterised, in addition to the usual roughness and haziness of the cornea, by varicose dilatation of the blood-vessels on the surface of the eye, and the presence of a blueish-white ring close to the edge of the cornea. Opaque spots, of greater or less extent, are seen in the cornea; the iris is not affected, or only very partially so, there being perhaps a single tag of adhesion between the edge of the pupil and the capsule of the lens. A loose fold of thickened conjunctiva not unfrequently forms at the edge of the cornea, and keeps the eye in a state of irritation; and sometimes a portion of the epithelium of the cornea in a thickened state, becomes loose, as if separated from the anterior elastic lamina by the intervention of a watery fluid. There is much lacrymation, and often neuralgic pains round the orbit. Vision is much impaired.

The same causes excite this corneitis as that last described. A slight scratch of the cornea I have known to excite it in a highly gouty subject. In a lady whom I had operated on successfully for cataract by extraction, this kind of corneitis occurred, sixteen years after the operation, and was attended by the peculiar detachment of the corneal epithelium which I have mentioned.

Moderate depletion, and the exhibition of warm purgatives, followed by sulphate of quina, I have found the best general treatment. Belladonna, given internally, lessens greatly the lacrymation. Warm fomentations to the eye, and the external use of belladonna, are proper. The thickened fold of conjunctiva at the edge of the cornea should be excised.

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[1] Treatise on Diseases of the Eye, p. 347; London, 1841.

[2] Practical Work on the Diseases of the Eye; Vol. i. p. 217; London, 1840.

[3] Oculist's Vade-mecum, p. 112; London, 1843.

[4] Obré, Lancet, April 30, 1842, p. 150.

[5] Ammon's Zeitschrift für die Ophthalmologie; Vol. ii. p. 154; Dresden, 1832.

SECTION XIX. — IRITIS IN GENERAL.

Syn. — Iriditis; *Good.* Uveitis; *Simeons.* Inflammation of the eyeball; *Jacob.*

Fig. Wardrop, Pl. VIII. *figs.* 2, 3. Ammon, Thl. I. Taf. XIV. *figs.* 8—11, 13, 14, 17—21, 23. Ammon de Iritide. Dalrymple, Pl. XIX. *figs.* 1—3, 5. Sichel, Pl. X. *figs.* 1—3.

It is remarkable that, although the effects of inflammation of the iris were observed by Hippocrates, for the expressions which on one occasion[1] he applies to the pupil, can refer only to that opening when filled with lymph, contracted, and irregular from adhesions, and although these and other symptoms of the disease must have been noticed by all succeeding observers, we owe the first distinct description of iritis to a German surgeon of the present century.[2] From the fact that the iris is nourished in a great measure by two arteries, completely distinct from those which belong to the other textures of the eye, we may readily conceive how iritis may exist as independently of inflammation in the other membranes of this organ, as does conjunctivitis, sclerotitis, or corneitis. From the two arteries in question, and from other sources, the iris is supplied with a quantity of red blood large in proportion to its size; it can scarcely be doubted that it is also supplied with nerves both of the motive and sensitive class; hence its great liability to inflammation. One chief danger to be dreaded from iritis arises from the fact, that the inflammation to which the iris is generally subject, is of the adhesive kind, so that in the course of a neglected or misunderstood attack, the pupil may become obliterated by an effusion of coagulable lymph. There always attends upon iritis, a degree of retinitis; and this constitutes another not less dangerous part of the disease.[3] Besides this, there is always present some sclerotic and conjunctival inflammation; the anterior hemisphere of the crystalline capsule is, in every case, more or less affected; and often the inflammatory action involves the choroid. Yet the iris is plainly the focus of the diseased action, and the seat of the most striking morbid changes. It is at the pupillary edge of the iris that the disease generally appears to commence, whence it spreads to the rest of the iris, to the capsule of the lens, and to the choroid and retina, while the sclerotic and conjunctival inflammation which attends it, appears to be sympathetic. That the iris is often the only part which has permanently suffered, is inferred from the fact, that the formation of an artificial pupil is sometimes found to restore vision, in cases where iritis has obliterated the natural pupil, plainly showing that the choroid and retina have not been seriously involved.

Symptoms.—There are certain symptoms which characterise inflammation of the iris, from whatever cause it proceeds.

1. Zonular sclerotitis; fine hair-like vessels, running in radii towards the edge of the cornea. (*fig.* 50. p. 433.)

2. Discoloration of the iris; so that, if naturally blue, it becomes greenish; if dark-coloured, reddish; the result of increased vascularity, and subsequently of effusion of lymph into its substance, or on its posterior surface.[4]

3. Contraction, irregularity, and immobility of the pupil.

4. Effusion of coagulable lymph into the pupil and posterior chamber, and occasionally into the anterior.

5. Adhesions of the iris, especially of its pupillary edge, to the capsule of the lens; in some rare cases, to the cornea.

6. Tubercles, pustules, or abscesses of the iris.

7. Opacity of the lens, or of its capsule.

8. Dimness of sight, and sometimes total blindness.

9. Pain in the eye, and nocturnal circumorbital pain.

In every case a sufficient number of these symptoms will be met with, to enable the observer to decide that the disease before him is iritis. All of them are by no means invariably present. We sometimes find, for instance, a dilated pupil in iritis, probably from the co-existence of amaurosis; and in some otherwise well marked cases, there is not the slightest pain in the eye or head. Iritis may also exist in a very marked manner, without any effusion of lymph, morbid adhesions, or tubercles of the iris, these being part of the changes which take place only in the second stage of the disease, and even then not in every case.

Different seats of the disease.—When inflammation affects principally the covering prolonged over the front of the iris from the cornea, the disease is styled *iritis serosa;* when the proper substance of the iris is affected, it is called *iritis parenchymatosa;* when the posterior surface seems chiefly involved, the term *uveitis* has been employed.[5]

Causes.—Inflammation of the iris arises from various causes. Those best ascertained are the following:—

1. Sudden transitions from heat to cold, exposure to cold draughts, overuse of the eyes on minute objects, especially by artificial light, and various other influences, give rise to idiopathic or rheumatic iritis.

2. Constitutional syphilis, and syphiloid diseases.

3. Gonorrhœa, followed by synovitis, operating through the constitution.

4. Scrofulous inflammation of the iris occurs along with corneitis, as a secondary disease; while in some less frequent cases, we meet with a scrofulous iritis which may be regarded as primary.

5. There is a very peculiar iritis, called arthritic by the Germans,

who regard it as depending on gout. It seems frequently, if not always, connected with the diseased state of body, produced by the long-continued operation of poisonous substances, especially alcohol and tobacco, on the assimilating and nervous systems.

6. Injuries. Such wounds, for example, as are inflicted in the different operations for cataract.

I exclude from the above enumeration, those instances of iritis which, like that which follows scrofulous corneitis, are extensions of inflammation from some of the other textures of the eye to the iris; such as that which occurs sympathetically, in consequence of injuries of the cornea and iris of the opposite eye, and that which follows remittent fever. In both these cases, I believe the original disease to be inflammation of the retina, not of the iris.

Stages.—Iritis has been considered[6] as presenting three stages. The *first* stage is characterised by increased vascularity of the sclerotica, discoloration of the iris, haziness and inactivity of the pupil, dimness of sight, and pain in and round the eye. In the *second* stage, we have effusion of lymph into the pupil, abscesses of the iris, contraction of the pupil, adhesions of the iris to the crystalline capsule, increase of pain, and greater defect of sight. The *third* stage presents red vessels ramifying on the iris and in the pupil, the pupil closed, the lens and its capsule opaque, the retina insensible, the eyeball changed in shape, being flattened under the recti, the choroid protruding through the attenuated sclerotica, and the eye boggy to the touch.

Degrees and forms of the disease—Prognosis.—The course of iritis presents, not only different stages, but the disease is met with of very different degrees of severity.[7] In slight and recent cases, complete restoration may be promised; in more serious cases, the recovery which can take place is only partial; in severe and neglected cases, it is but too often evident that no hope can be held out of our being able to restore vision, or even to save the form of the eye.

The distinction of *acute* and *chronic* iritis is of considerable importance.[8]

The disease occurs in an acute form, in robust individuals of full habit, where a powerful cause has acted on the organ, and more especially if the case has been neglected at the commencement, or the cause has continued to act. With bright external redness, great distension of vessels, rapid and general change of colour in the iris, contraction of the pupil, effusion of lymph, dulness of the cornea, loss of sight, agonising pain of the eye, and severe headache, there is considerable fever, with restlessness and want of sleep. In a few days vision is irreparably lost.

On the other hand, iritis may arise so imperceptibly, and proceed so slowly to effusion of lymph, and to diminution or even loss of sight, that no pain is felt in the part, and scarcely any redness takes place. No alteration is observed by others, and sometimes not even by the patient, who has been known to discover the disease accidentally on shutting the sound eye, and finding the vision of the other gone.

Inflammation more readily extends from the iris to the rest of the organ in acute cases, yet this extension may occur when the disease is chronic. The prognosis must be drawn from a combined consideration of the time the affection has lasted, the cause upon which it depends, and the visible effects already produced. Irreparable injury to the organ may occur in a few days, when the inflammation is acute. A fortnight, three weeks, or a month, may elapse, when it is of ordinary severity, without any serious mischief; while a still longer duration does not preclude the expectation of recovery, in the more chronic form of the complaint.

Sequelæ.—Among the most striking effects of iritis, are the changes which the pupil undergoes, and which are often of a permanent kind. Adhesion of the pupil to the cornea (*synechia anterior*) is amongst the rarest results of the disease. Adhesion to the capsule of the lens (*synechia posterior*) is very common. Contraction of the pupil, or *atresia iridis*, and false cataract, or *cataracta lymphatica*, are sequelæ of great importance; and not less so is amaurosis. The inflammatory symptoms, to whatever degree of violence they may have reached, after an indefinite period begin to abate, even without medical interference; in idiopathic cases, however, seldom without contraction of the pupil, and synechia posterior; in syphilitic cases, seldom without atrophy of the eye; in arthritic cases, seldom without total loss of sight. The best-directed treatment may sometimes fail in preventing these disastrous results.

The pupil may be almost completely closed, and filled up by a grayish membrane. On dissection, false membranes are found radiating from the pupil, behind the iris, and even coating the internal surface of the choroid.[9] The power of vision is, in general, entirely lost. This state is called by Schmidt, *atresia iridis completa.*

Perhaps there has been no profuse quantity of effused lymph, and when the inflammatory symptoms subside, the pupil, though remaining small and irregular, is found still to possess some degree of mobility. The coagulable lymph by which the pupil had been occupied, may be reduced to the state of a fine pseudo-membrane, opaque in most instances at its centre, but somewhat transparent, and perhaps reticulated, towards its edge. The pupillary margin of the iris may not adhere all round to this pseudo-membrane, but only at some points, the rest being free, and hence the pupil is very irregular, especially when artificially dilated. Vision under these circumstances is impaired, not destroyed; and is sometimes greatly improved by the application of belladonna, so as to dilate the pupil, and allow light to penetrate through the clear spaces in the pseudo-membrane. This constitutes *atresia iridis incompleta.*

In a third set of cases, only part of the iris has been affected with inflammation. When this has gone off, a mere thread of opaque matter remains in the otherwise transparent pupil. By this thread, a single point of the margin of the pupil is kept fixed, while every other part is free and moveable. This is termed *atresia iridis partialis.*

If appropriate treatment has been begun late in the disease, or followed out inefficiently, *amaurosis* is apt to be the result. The pupil may expand and even become clear, yet the retina may be so affected, especially in syphilitic cases, that vision does not return.

A very common sequela of iritis is *myodesopia.*

Diagnosis.—The diseases with which iritis is apt to be confounded, are rheumatic and catarrho-rheumatic ophthalmia, corneitis, aquo-capsulitis, inflammation of the crystalline capsule, and retinitis.

1. Rheumatic ophthalmia, catarrho-rheumatic ophthalmia, and rheumatic iritis, are three diseases which merge into one another. A degree of iritis almost invariably attends the two former inflammations. Exactly as it is difficult in many cases of catarrho-rheumatic ophthalmia, to say whether the disease affects more the conjunctiva or the sclerotica, so it is often doubtful whether we should set down some cases of pure internal ophthalmia, which we meet with, as examples of sclerotitis or of iritis.

2. Although there are present in corneitis a sclerotic zone of inflammation, dimness of vision, and supra-orbital pain, as in iritis, still an attentive examination of the state of the cornea will easily enable us to distinguish the two diseases. The cornea is generally much more opaque in corneitis than it ever becomes in any case of iritis, the opacity is speckled and streaked in a peculiar manner, and partially covered by the ramifications of red vessels. If through the cornea we observe the pupil moving briskly, according to the various degrees of light to which the eye is exposed, we may conclude that the case is one of pure corneitis; but as has already been mentioned, we meet with cases in which iritis and corneitis are conjoined, and as the cornea is often too dim to permit of the iris itself being distinctly seen, we are obliged to judge of the existence of this combination by the size and mobility of the pupil. If it be contracted and fixed, iritis is undoubtedly present.

3. In inflammation of the lining membrane of the cornea, or aqueous capsule, there is radiated sclerotitis, seldom, however, surrounding the whole cornea, with dull aching pain in the forehead, so that in these respects there is a resemblance to iritis. The opacities on the internal surface of the cornea are very diagnostic of aquo-capsulitis; they are milky spots producing a peculiar mottled appearance, very unlike any of the common specks of the cornea. It often happens, however, that in aquo-capsulitis there is an extension of inflammation from the lining membrane of the cornea to the iris, producing tags of the pupil to the crystalline capsule.

4. The disease most resembling iritis is inflammation of the crystalline capsule, first accurately described by Professor Walther. Partial zonular sclerotitis, discoloured iris, nebulous, contracted, and fixed pupil, and even adhesions between the iris and the capsule, are present in this disease; and yet it appears specifically different from iritis. The pain which attends it is less, the inflammation is generally limited to one spot of the capsule, it is slower in its progress than iritis, and it is much less under the influence of remedies of any kind. It cannot be denied, however, that inflammation of the crystalline capsule is always accompanied by some degree of iritis.

5. Retinitis resembles iritis in the appearance of the external red-

ness by which it is attended, and in the closure of the pupil which an extension of the inflammation speedily produces; but its attack is more sudden, its progress much more rapid, vision and even the perception of light being destroyed much earlier, without pain, and even before the pupil is affected.

General cure of iritis.—The chief objects to be attended to in the treatment of iritis are:—I. To subdue the congestion. II. To prevent the effusion of coagulable lymph, or to promote its absorption, if it is already effused. III. To preserve the pupil entire, or to dilate it, if already contracted. IV. To assuage the attending pain. To fulfil these objects we have recourse to a combination of remedies.

1. *Blood-letting* must in no case be neglected, and when the patient is robust and the inflammation severe, must be vigorously and repeatedly employed. Local bleeding is by no means adequate to arrest iritis even of moderate severity. General bleeding must be premised and repeated till the constitutional irritation and local symptoms abate. In no disease of the eye is venesection so remarkable for its sudden effects as in iritis. The patient who could not previously discern the face of a person standing before him, except as a mere mass, will often exclaim, on opening the eye after venesection, that he sees clearly. I have observed this especially in syphilitic iritis. The blood taken from the arm in iritis is very buffy, especially when the disease is rheumatic or syphilitic. Cupping is not to be trusted to as a substitute for venesection. It is comparatively of no effect. After venesection, leeches may be applied freely round the eye, and repeated every day, or every second day, till the inflammation is subdued. Scarification of the conjunctiva is generally useless, or even hurtful, in iritis.

2. *Purging, &c.* The use of cathartics, and diuretics, with a spare and cool diet, confinement within doors, rest of the whole body, and exclusion of the light from the eyes, will be found powerful auxiliaries. In many cases, I have noticed mercury do little good till it purged, or till purgatives were administered.

3. *Antimony,* and other nauseants, prove useful in two ways. They moderate the circulation, and render the system more susceptible of the influence of mercury.

4. *Opiates* are in general imperiously demanded in iritis, by the severity of the nocturnal circumorbital pain, as well as by the distress which the patient experiences in the eye itself.

5. *Mercury* given so as to affect the constitution, is a most valuable remedy in iritis. By subduing the inflammation, it prevents, as was first pointed out by Professor Beer, the effusion of coagulable lymph from the iris, or if that substance is already effused, powerfully promotes its absorption. It is plain that mercury must be given so as to act more promptly in iritis than in primary syphilis, on account of the danger of allowing contraction and adhesions of the pupil to form. At the same time, we should avoid producing sudden and severe ptyalism, lest we be obliged to stop the mercury prematurely, and thus the disease be allowed to march on and destroy vision, before we can venture to resume it. The most useful form

for administering mercury in iritis, is calomel with opium, given in small doses frequently repeated. Nichet[10] gives from 10 to 20 grains of calomel daily, with or without opium, according to circumstances. He thinks prompt salivation important. In five days, and sometimes in two days, he obtains this effect.

6. *Iodide of potassium* possesses very considerable power over iritis. I should never trust to it, however, in the first instance; but when we are obliged to interrupt the employment of mercury, this preparation may be substituted in its room.

7. *Turpentine* has been recommended as a remedy which, taken internally in cases of iritis, displays properties analogous to those of mercury.[11]

8. *Sulphate of quina*, not only in the scrofulous variety of iritis, but even in the syphilitic, often proves of great service.

9. *Blisters* behind the ears, or to the nape of the neck, are of material use after sufficient abstraction of blood. Previously to this, they do harm.

10. *Belladonna*, in the first stage of iritis, speedily expands the pupil; subsequently, it has no apparent effect, till the inflammation is considerably subdued by blood-letting and the use of mercury. It ought to be employed in every case, and in all stages of the disease. The usual mode of employing it is in extract, moistened to the consistence of cream, and liberally painted on the eyebrow and eyelids morning and evening. As it is during the night that the disease appears to make most progress, and as during sleep there is a natural closure of the pupil, which must favour the permanent contraction which iritis tends to produce, the evening is evidently the most proper time to apply the belladonna[12], if used only once in the 24 hours. As it ceases to act after becoming dry, the parts covered with it should frequently be moistened with a little water, by means of the finger or a camel-hair pencil.

Belladonna acts much more powerfully in dilating the pupil, after blood has been taken from the arm. Having been waited on one morning by a gentleman with iritis, I applied belladonna and advised him some mercurial pills. Being sent for to see him in the evening, I found the pupil irregular, but not expanded. I bled him at the arm, and on returning two hours after, I found the pupil widely dilated, although no more belladonna had been applied.

As soon, in general, as the inflammation has subsided in any considerable degree, and the fibres of the iris have become somewhat freed from the effused lymph, the pupil will begin to expand; and even in neglected cases, where it has been allowed to become almost obliterated, the continued use of belladonna for months is sometimes attended by a gradual dilatation of the pupil, an elongation of the threads that bind it to the capsule, and a corresponding improvement in vision. After the acute inflammation is gone, a filtered aqueous solution of the extract of belladonna, or a solution of the sulphate of atropia, may be dropped upon the eye, morning and evening. Applied thus to the conjunctiva, belladonna has more effect than when painted on the skin, and sometimes breaks through adhesions when smearing the outside of the eyelids has failed.

There is an occasional effect of belladonna, which perhaps may appear to afford ground for objecting to its use in the acute stage of iritis, namely, its operation on the proper substance of the iris, so as to cause it to contract, but at the same time leave the pigmentum nigrum, or uvea, attached to the capsule of the lens, whence it never afterwards appears to separate. That this tearing of the iris from the uvea sometimes happens from belladonna, is, I believe, undeniable. It is, however, a rare occurrence; very rare, if proper means are promptly adopted to subdue the inflammation; more apt to occur if the case is trusted, as some have recommended, to mercury, without blood-letting. After taking away blood, I never hesitate to apply belladonna.

Dr. Robertson mentions[13] a case in which an extraordinary effect arose from belladonna; for the pupil, expanding in consequence of its application, became fixed in the dilated state, giving the eye an amaurotic appearance. Dr. Robertson thinks it probable that this arose from lymph being effused, and matting together the fibres of the iris while under the influence of the belladonna.

The above mentioned remedies are suited, more or less, to every kind of iritis; but, of course, peculiar modifications in the treatment will be necessary according to the different causes of the disease, whether these be syphilitic, scrofulous, arthritic, or of whatever other nature, and according to the different symptoms which each species presents in individual cases.

Stimulating applications to the conjunctiva are in general useless and even hazardous in iritis. At any rate, they are never to be ventured on in the acute stage.

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[1] Prædictionum, Lib. ii. 28.

[2] Schmidt, Ueber Nachstaar und Iritis nach Staaroperationen; Wien, 1801.

[3] On retinitis, as a part of the disease called iritis, see Jacob's Treatise on the Inflammations of the Eyeball, p. i.; Dublin, 1849.

[4] On the changes in the colour of the iris produced by inflammation, see Hunter, London and Edinburgh Monthly Journal of Medical Science; February 1841, p. 79.

[5] Dzondi, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. i. p. 238; Berlin, 1820: Simeons, ibid. Vol. xi. p. 293; Berlin, 1828: Schindler, ibid. Vol. xii. p. 180; Berlin, 1828.

[6] Jacob, Op. cit. p. 22.

[7] Essay on Iritis, by the late George C. Monteath, M.D., Glasgow Medical Journal; Vol. ii. p. 43; Glasgow, 1829.

[8] Lawrence's Lectures in the Lancet; Vol. x. p. 257; London, 1826.

[9] Cloquet, Pathologie Chirurgicale; Pl. x. fig. 15; Paris, 1831.

[10] Gazette Médicale de Paris, 31 Dec. 1836.

[11] Observations on the Efficacy of Turpentine in the Venereal and other deep-seated Inflammation of the Eye; by Hugh Carmichael; Dublin, 1829.

[12] London Medical and Physical Journal; Vol. liv. p. 113; London, 1825.

[13] Edinburgh Medical and Surgical Journal; Vol. xxxii. p. 291; Edinburgh, 1829.

SECTION XX. — IDIOPATHIC OR RHEUMATIC IRITIS.

Fig. Beer, Taf. I. *fig.* 6. Taf. II. *fig.* 1. Dalrymple, Pl. XVIII. *fig.* 1.

It has already been mentioned, that attendant on rheumatic and catarrho-rheumatic ophthalmiæ, there is, in general, a degree of iritis. There is a third set of cases, chiefly arising, like these two ophthalmiæ, from exposure to atmospheric changes, suppressed perspiration, or over-use of the eyes, in which the iris is all along the part principally affected, and in which the attack is sudden, in this last respect resembling other diseases caused by external influences, and differing from those which, originating entirely in some constitutional or internal cause, advance slowly and insiduously. With this idiopathic or rheumatic iritis sometimes both eyes are simultaneously affected, with nearly equal severity. In other cases, only one eye is inflamed, or the one much more severely than the other.

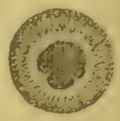
Local symptoms.—Dimness of sight is often the earliest symptom. The letters of a book appear pale, and the eye is soon fatigued. This state may continue for some days, with very little redness of the eye. By and by, every thing is seen, as if through a thick fog, probably from a thin coating of lymph over the capsule of the lens. To these subjective symptoms, certain objective changes are speedily added, indicative of the peculiar seat of the disease. These changes commence upon the edge of the pupil, whence they extend gradually towards the ciliary circumference of the iris. The pupil is seen to be contracted, the motions of the iris impeded, and the pupillary opening deprived of the bright black colour which is natural to it. The colour of the iris is next observed to undergo a change; first, in the lesser circle, which becomes of a dark hue, and afterwards in the greater, which grows green, if it had been grayish or blue; and reddish, if it had been dark-coloured. This change of colour is a never failing index of the substance of the iris being inflamed, and is apt to continue after all the other symptoms of iritis have been subdued. As soon as this change of colour has taken place to a considerable degree in the greater circle, the iris swells and projects towards the cornea, while the pupillary margin, losing its sharply defined edge, seems somewhat thickened, and is turned back towards the capsule of the lens.

The redness accompanying these changes is by no means considerable, and is at first confined to the sclerotic coat, in which a number of very minute rose-red vessels are seen, running towards the cornea. By and by, the redness increases, and is seen to arise partly from vessels developed in the conjunctiva. The vascularity is greatest round the cornea; towards the folds of the conjunctiva it fades away.

The patient complains of pain in the eye, in many cases severe and pulsative, and increased on motion of the organ; pain beneath the eyebrow; and circumorbital nocturnal pain, similar to what is met with in rheumatic sclerotitis.

If the disease be not checked, the pupil loses its circular form, it becomes irregular, sometimes nearly triangular, and at the same time presents a grayish appearance. Examined through a magnifying glass of short focus, or even by merely concentrating the rays of light upon the pupil through a double-convex lens, this grayish appearance is seen to be produced by a delicate flake of coagulable lymph. Into this the processes or dentations of the irregular pupillary margin of the iris seem to shoot, and it is afterwards found that, at these points, adhesions between the iris and capsule are apt to be established. It is owing to these adhesions that the patient, whose vision has been all along indistinct, sometimes complains of now being able to see only one side, or part of an object. For a time, there may be only one or two tags of adhesion, the rest of the pupil being free, so that on applying belladonna this aperture assumes a very irregular form (*fig.* 56.). A patient under my care had five tags, so that his pupil had the shape of an oak-leaf. Several or all of such adhesions may break across, under the influence of belladonna, especially when dropped upon the conjunctiva, and assisted by depletion and mercury. *Fig.* 57. shows the effect of one of the two tags, represented in *fig.* 56., having thus given way. After the tags have given way, minute whitish spots may be detected on the capsule, at the points where the adhesions existed.

Fig. 56.



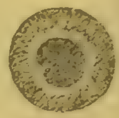


Fig. 57.

If the disease proceeds unchecked, the effusion of lymph into the pupil increases. It takes place likewise behind the iris, so that adhesions are formed between the uvea and the capsule of the lens. The lymph becomes organised, red vessels shooting into it from the iris.

In neglected cases, the pupil is often left much contracted, tagged, and angular, with the iris of a greenish or slate colour, and destitute of its healthy striated appearance and natural lustre. The lens sometimes becomes opaque, and disorganised.

By this time, the morbid sensibility to light, which prevailed at the commencement of the disease, is diminished; from the retina being involved in the disease, as well as from the state of the pupil, the powers of vision become gradually more and more limited, and at length little more than the perception of light remains. Not unfrequently, the patient complains of the sensation of a black spot, like a fly, or of several black or hazy spots, placed as it were at some distance before the eye, and partially intercepting the view of the objects.

As the disease proceeds, the cornea loses somewhat of its peculiar brilliancy, and occasionally very striking changes take place on the anterior surface of the iris. Spots of lymph form upon it; and, in other cases, lymph appears to be deposited in the substance of the iris; for, while it projects more and more towards the cornea, its fibres get collected into bundles, giving to its surface a peculiar plaited or puckered appearance. In some very rare cases, one or more yellowish-red elevations form on the anterior surface of the iris, most frequently about the union of its greater and lesser circles. Small at first, such an elevation gradually enlarges, projects towards the cornea, and is at length distinctly seen to be a cyst containing pus, which, finally bursting, discharges its contents into the anterior chamber, and thus gives rise to spurious hypopium. A small quantity of blood is sometimes extravasated at the same time into that cavity.

Such is the general history of a neglected case of rheumatic iritis. We meet, of course, with many degrees of severity in this disease; while its sequelæ are, as has been described in the last Section, varied and more or less detrimental to vision. The inflammation will at length subside, even though no remedies are employed; but, in such cases, vision will in general be lost.

Constitutional symptoms.—Like rheumatic sclerotitis, this inflammation of the iris may attack an individual who has never suffered from rheumatism in any other part of the body. Not unfrequently, however, the subjects of this disease have long been subject to other rheumatic affections, although the iritis appears in every case to be excited by some new exposure to cold or similar cause, and never, as far as I have seen, to be metastatic. Thirst, whiteness of the tongue, and accelerated pulse, attend rheumatic iritis. The bowels are frequently confined, and there is occasionally a disposition to nausea.

Causes.— These are the same with those already enumerated as producing rheumatic ophthalmia. Some individuals of confirmed rheumatic habit, suffer exceedingly from one or more attacks of this disease every year, each succeeding attack leaving the eye in a worse state, till at length vision is destroyed.

This iritis frequently occurs during, or after the use of mercury, in consequence of this medicine powerfully predisposing the whole body to suffer from the exciting causes of rheumatic inflammation.

I have known rheumatic iritis excited by incessant reading for some days, during confinement from a cold. The irritation of a decayed tooth, or stump, communicated through the fifth nerve to the brain, and thence by reflection to the eye, has produced the disease.

Treatment.— 1. *Blood-letting.* The degree of synocha which is present in rheumatic iritis must guide us as to the extent and kind of bleeding. Repeated venesection is almost always necessary, followed by the liberal application of leeches round the eye.

2. *Mercury.* Scarcely is the mouth affected by the use of mercury, when we observe the most marked abatement of the symptoms. Two grains of calomel, with one-third of a grain of opium may be given in acute cases, every six hours, and less frequently in chronic cases, taking care not to make the mouth sore too soon.

It cannot be denied, however, that, unless the patient be careful to avoid new exposure to cold, the mercurial treatment may actually prove injurious. He ought to leave off his usual employment, confine himself within doors, and, if the case is severe, keep his bed. Unless this be done, the disease is apt to recur with redoubled fury, even from such slight causes as changing the head-dress, passing from one room to another, and the like. It becomes a question, when the patient is poor, and unprovided with proper clothing and shelter, whether we should give mercury at all, unless the patient be admitted into an hospital. We are almost certain by its omission to ruin the eye, and by its exhibition seriously to endanger the general health. The patient's room should be darkened, and have a moderate fire in it in winter.

3. *Iodide of potassium,* in doses of 4 or 5 grains, thrice a-day, may be given, if from any cause the use of mercury is interrupted.

4. *Turpentine* may be tried with some hope of success in similar circumstances, in the manner recommended by Mr. Carmichael for syphilitic iritis. See next Section.

5. *Rest,* and *the antiphlogistic regimen,* must be strictly enjoined. The patient must relinquish animal food, and fermented liquors.

6. *Opiates.* If we give calomel, we combine it with opium. If we refrain from the internal use of mercury, a powerful opiate ought to be given every night, to assuage the pain. Friction of the head with warm laudanum, is also to be employed, or friction with mercurial ointment mixed with opium. Should this, along with the opiate taken internally, fail to prevent the nocturnal attack of pain in the eye and round the orbit, considerable relief may be obtained by fomenting the eyelids and parts around with hot flannel cloths, wrung out of decoction of poppy-heads, or belladonna leaves, care being taken to dry the parts well as soon as the fomentation is finished, and then cover them with a linen compress, previously heated at the fire.

7. *Purgatives.* As much castor oil or sulphate of magnesia as will open the bowels moderately, is to be given every morning.

8. *Diuretics.* Small doses of nitre and cream of tartar, every two or three hours, are useful.

9. *Diaphoretics* are of service, but are liable to the same objection as mercury. Unless the patient can protect himself from cold, they ought to be avoided.

10. *Cinchona* is undoubtedly a remedy of considerable utility in the treatment of rheumatic iritis. I am as much opposed, however, to the idea of trusting to it almost alone, as I am to the plan of confiding solely in the antiphlogistic and sorbefacient powers of mercury in this disease, to the neglect of blood-letting and other depletory means of cure. In an inflammation of so dangerous a nature as iritis, we should be ready to avail ourselves of every remedy, and never allow ourselves to be beguiled into bad practice by an affectation of simplicity.

11. *Blisters* behind the ear, on the temple, and on the back of the neck, are of more service in the rheumatic, than in any other kind of iritis. To produce a more moderate degree of counter-irritation, the laudanum with which the head is rubbed when the nocturnal pain threatens to begin, may be mixed with an equal quantity of tincture of cantharides.

12. *Belladonna* should be freely applied, morning and evening, to the eyebrow and eyelids. In general, it has little apparent effect till the inflammation is considerably subdued by bleeding and calomel. It is often used for eight days or more, and little or no dilatation of the pupil is produced, till, upon taking away more blood, or the gums becoming touched, the pupil suddenly expands; an event to be hailed as very favourable.

13. *Vinum opii* is serviceable in the decline of this disease. Any application to the eye itself in the form of collyrium, drop, or salve, is worse than useless, in the acute stage.

Prevention.—Those who are subject to rheumatic iritis, must carefully avoid the exciting causes; especially, sudden transitions from heat to cold, violent exercises, crowded assemblies, late hours, card-playing, much reading or writing, excess in eating and drinking, and the like. Sea-bathing in summer is sometimes of use in preventing relapses. For the same purpose I have known a long-continued course of sarsaparilla very serviceable. Removal to a southern climate during the winter, may be the means of saving a patient from his usual attack.

SECTION XXI.—SYPHILITIC IRITIS.

Fig. Beer, Taf. II. *fig.* 4. Dalrymple, Pl. XVIII. *figs.* 3–6. Pl. XIX *fig.* 4. Sichel, Pl. XI. *fig.* 6. Pl. XIII. *figs.* 2, 4–6.

Like other secondary syphilitic affections, syphilitic ophthalmia is insidious in its early stage, but after a time rapidly and extensively destructive. If left to itself, it does not fail to disorganise almost every texture of the eyeball, commencing with the iris, and extending its destructive influence to the choroid and retina, the vitreous humour, and even the cornea and sclerotica.

Local Symptoms.—The general diagnostic symptoms of iritis, as enumerated at page 532, are in general well marked in the syphilitic species; but it is important to observe, that in the incipient stage, they are sometimes very slight, syphilitic differing in this respect from rheumatic iritis, which from the external nature and sudden action of its exciting cause, is generally characterised even from the commencement, by signs which can scarcely be overlooked or mistaken. In the syphilitic species, on the other hand, the redness is sometimes, for a length of time, scattered or fascicular rather than zonular, and the changes in the appearance of the iris and pupil very slight. This shows the necessity, in suspected cases, perhaps I ought to say in *all* cases of iritis, of examining with attention the state of the skin and throat, and inquiring into the history of the patient's previous health. We almost always find the remains of a syphilitic eruption, or sore throat, attendant on syphilitic inflammation of the iris; in many cases this ophthalmia is co-existent with active secondary symptoms in various textures of the body; sometimes, though rarely, with primary symptoms; and in all instances, the history of the patient's health will throw a degree of light on the affection of the eye, which may be the means of preventing the most disastrous consequences.

It is unnecessary to repeat any description of the zonular redness, discoloration of the iris, contraction, irregularity, and immobility of the pupil, effusion of lymph, and other general symptoms of iritis, as they occur in the syphilitic species. In none of these symptoms, nor in the dimness of sight, and pain which attend them, does there appear anything really diagnostic; although some authors have imagined, that they had discovered in certain of these symptoms, peculiarities upon which a diagnosis could be founded. The fact that even directly contrary appearances have been enumerated as diagnostic of syphilitic iritis, shows that to distinguish this species from the rheumatic, something more must be taken into account than any differences which may be observed in the general symptoms of the disease. Perhaps I ought to except a tawny or rusty colour of the iris near its pupillary edge, which is certainly observed in many syphilitic cases, and in them almost only.

Beer has described two remarkable appearances as characteristic of syphilitic iritis; *viz.* dislocation of the pupil, and condylomata sprouting from the iris.

The first of these symptoms consists in a gradual movement of the pupil upwards and inwards, so that instead of being placed, as it is in health, nearly in the centre of the iris, it comes to be situated considerably closer to the upper and inner edge of that membrane. This displacement I have seen in chronic rheumatic iritis; and still more frequently in scrofulous sclerotitis, unattended by iritis. I cannot regard it, then, as diagnostic of syphilitic iritis. That it is occasionally met with in this disease, I have no doubt; but I believe it to be a symptom, not so much of the iritis as of an affection of the ciliary or iridal nerves.

As for the condylomata described by Beer as diagnostic of this disease, they are really tubercles, pustules, or small abscesses, very rarely met with except in syphilitic cases, and generally accompanied or preceded by a syphilitic eruption over the body. On first showing themselves, they are of a reddish-brown colour, their surface, which is somewhat irregular, appearing, when viewed through a lens of short focus, to be covered with innumerable red vessels. By and by, they assume a yellowish hue, project from the plane of the iris, and enlarge sometimes to such a size as almost to touch the cornea. Dr. Monteath supposed that they sometimes form on the posterior surface of the iris, pushing it forwards, and forcing a passage between its fibres. At length they burst, and discharge the purulent matter they contain, into the anterior chamber. After this, the cyst which contained the matter, shrinks; but from the corresponding portion of the edge of the pupil being, I believe, always adherent to the capsule, as the shrinking of the cyst goes on, the ciliary edge of the iris is apt thereby to be separated from the choroid, or its fibres to be lacerated and absorbed, so that either the uvea comes into view, of a black colour, or actually an aperture is formed in the iris, which never perfectly closes.

Tubercles may form at any part of the iris, close to the pupil, near the ciliary edge, or midway between them. When situated at the ciliary edge, they sometimes disappear from the anterior chamber, form a projection of the choroid and sclerotica, behind the cornea, and burst externally. This I never myself observed; but in more than one instance I have seen this disease combined with a hard elevation, of a dark red colour, somewhat like a phlegmon, behind the edge of the cornea, ending in attenuation of the sclerotica and protrusion of the choroid.

As to the question, whether such tubercles occur only in syphilitic cases, I have seen a small yellow cyst form on the surface of the iris in rheumatic iritis, but this is a very rare event.[1] The existence of tubercles, therefore, ought immediately to rouse suspicion that the case is syphilitic.

If syphilitic iritis is neglected, not only is the pupil speedily closed, and bound down to the capsule of the lens by effused lymph, but the iris is remarkably changed in its appearance, much more so than in any other species of the disease. The cornea, also, becomes hazy, and sometimes dotted over with minute brown spots. The anterior chamber becomes less in size, from the iris being pushed forwards, and at length from the cornea shrinking in diameter. The sclerotica, choroid, and retina all partake in the inflammation; the retina becoming insensible to light, while the choroid protrudes, here and there, of a deep blueish colour, through the attenuated sclerotica. A patient at the Glasgow Eye Infirmary was convalescent, and stayed away for some weeks. When he returned, his right eye presented a very large and prominent choroid staphyloma, encircling the temporal side of the cornea; the edge of the pupil was drawn back, and the surface of the iris tawny. He still retained tolerable vision with the eye in this condition.

The degrees of syphilitic iritis, and its sequelæ, are of course very various. Sometimes the pupil is dilated to twice its natural diameter, the centre remaining black, while its edge is surrounded by tubercles. In such cases, though part of the pupil is pretty clear, the patient sees little or none on account of the condition of the retina; yet from this state the eye may completely recover, by appropriate treatment. The terminations of the disease, if not counteracted by an early employment of mercury, are closure of the pupil, obliteration of the anterior and posterior chambers, and atrophy of the eyeball.

Very differently from what happens in neglected rheumatic iritis, the inflammation in syphilitic iritis does not wear itself out, and end in simple loss of vision by closure of the pupil, but goes on from one texture of the eye to another, till the whole are involved in a process of disorganisation, which leaves scarcely a trace of natural structure.

In extreme cases, the lens and vitreous humour are disorganised, being converted into a pultaceous mass, which may at last be observed forming whitish projecting points through the choroid and sclerotica. From such a state of disease it is impossible for the eye to recover, so as to preserve its natural form. Neither do we find that puncturing the eye in such a state, affords any relief to the pain which the patient suffers; it is not from any collection of purulent fluid that the appearance above mentioned arises, and nothing is discharged on passing the lancet through the tunics. If the system is brought under the action of mercury, the eye will, under these circumstances, shrink to a small size; but if this is not done, if an insufficient quantity of mercury be given, or that medicine be too soon abandoned, the sclerotica may give way, and a fungous excrescence protrude. At last, from the severity of the pain in the eye and head, the inefficacy of opiates, the fever and debility which are induced, and from the unseemly and disorganised state of the eye, we shall be obliged to remove it with the knife.

In many cases of syphilitic iritis, the treatment has the effect of completely removing all the objective symptoms of the disease; but the retina falls into a state of more or less complete insensibility.

The pain which attends syphilitic iritis varies much in severity. In general, it is considerable both in the eye and round the orbit, attended by lacrymation and photophobia, and, like syphilitic pains in the bones, greatly aggravated during the night.

Constitutional symptoms.—This disease is generally accompanied by very evident manifestations of syphilitic cachexia. The pulse is quick, the general strength impaired, the appetite lost, the countenance pale or sallow, and the skin covered, especially during the night, with a clammy perspiration. If syphilitic iritis has been long neglected, and attended with severe nocturnal pain, the patient becomes emaciated and greatly enfeebled. The local secondary symptoms with which I have most frequently found syphilitic iritis associated, have been pustular, papular, and scaly eruptions on the face and over the body, and next to these, sore throat. The pustules on the face, which I have met with as attendants on syphilitic iritis, have frequently been of a dark livid colour, large, hard, and seated so deeply in the skin as almost to deserve the name of tubercles. The scaly eruptions on the face have occasionally presented an approach to the areolar form of lepra. Over the body, again, where the eruption has generally been of a more acute character, the appearance has been that of numerous circular elevated spots, of a brownish-red colour, about the size of a split pea, ending in a desquamation of successive thin pellicles of cuticle, and leaving copper-coloured stains, with a deficient state of the rete mucosum, so that they feel depressed when the finger passes over them; a state which continues through life.

Infantile cases.—Iritis is not unfrequently the consequence of congenital syphilis, and is sometimes the first symptom which is observed. Besides zonular redness and discoloration of the iris, the surface of the crystalline capsule in such cases is apt to become quite red. The pupil closes after a time, the anterior chamber fills with pus, and the cornea becomes opaque. The usual copper-coloured eruption appears over the body. The infant may have derived the disease from the father, without the mother having shown any syphilitic symptom.

Exciting causes.—Although this disease is unquestionably an effect of the contamination of the constitution by syphilis, and although it commences, in many cases, without any known exciting cause, yet it not unfrequently happens that, like other secondary symptoms of syphilis, and especially sore throat, it is excited by exposure to cold. Slight blows on the eye, imprudent over-exertion of the organ, and intemperance, seem in other instances to aid in bringing on this disease, which, therefore, may be regarded, at least, in many cases, as an effect of certain external causes operating on a constitution imbued with a morbid poison.

Relapses.—Even when syphilitic iritis terminates in the most favourable manner, the eye, for a long time afterwards, is peculiarly sensitive to the influence of cold and moisture. On every exposure to these, the sclerotic circle of inflammation may be observed to return, the light is felt to be disagreeable, and the eye discharges a superabundant quantity of tears. For the same reason, the formation of an artificial pupil, when this is required from the effects of syphilitic iritis, is generally followed by such a degree of renewed inflammation as to frustrate the attempt to restore vision.

Treatment.—1. *Blood-letting* is generally necessary in syphilitic iritis. Dr. Monteath's testimony on this point is valuable. "Judging from my own experience," says he[2], "I differ decidedly from those who put their whole faith in mercury in the cure of this species, to the exclusion of the other remedies, such as bleeding, blistering, &c. In my own practice, I have seen the disease running on with rapid strides to dangerous hypopion, notwithstanding the full action of mercury, and its further progress at once arrested by a full bleeding from the arm, and a blister on the hind-head."

I have been obliged to bleed repeatedly at the arm, besides applying leeches, before the symptoms yielded sufficiently to permit of much benefit being derived from the mercury which was employed.

2. *Regimen.* The patient must abstain from animal food and fermented liquors. We may be tempted, when the system seems in a weak and shattered state from syphilitic cachexia and other causes, to put the patient on an animal diet, prescribing at the same time small doses of mercury. Under this plan, the general health may improve, but the case will probably end in closure of the pupil.

3. *Opiate frictions* round the orbit are carefully to be employed, about an hour before the nightly attack of pain is expected; after which, the eye is to be covered with a fold of linen, warmed at the fire. Whenever the pain threatens to recur (and it is particularly apt to do so about midnight), the opiate friction ought to be repeated. Laudanum, an infusion of extract of belladonna in laudanum, a mixture of laudanum with tincture of cantharides, moistened opium, opiate mercurial ointment, or tincture of tobacco, will be selected for this purpose, according to the circumstances of the case and the opinion of the practitioner.

4. *Mercury.* Upon this medicine we place our chief reliance for arresting syphilitic inflammation of the iris, and removing the morbid changes which may have already been produced in that membrane, and in the pupil. It is not an alterative course of mercury, however, which is to be employed. The constitution must be thoroughly mercurialised, and the mouth made distinctly sore. In many cases, I have known little effect produced till pretty profuse salivation was established. I remember one case in which mercury had been tried, and laid aside as ineffectual, by the family-doctor; even after it was recommenced, it produced but very slight benefit, until the patient having taken 10 grains of calomel, with 5 of opium, daily, for several days in succession, the mouth suddenly became sore, and the iritis went off as by a charm. It was a very decided syphilitic case, the body being covered by a copper-coloured eruption.

The combination of calomel with opium is the best form for exhibiting mercury in this disease. A pill, containing 2 grains of the former, with from a quarter of a grain to a whole grain of the latter, may be given morning, noon, and night, till the gums are decidedly affected; after which, two pills daily may be continued for some time; and when the mercurialisation is more advanced, one at bedtime only. This is the plan to be followed in severe cases, where it is important instantly to arrest the progress of the disease, prevent deposition of lymph into the pupil, or procure its absorption, if already effused. In milder cases, we may trust to a pill morning and evening from the beginning.

Other forms of mercury have been employed in the cure of this disease, especially inunction round the eye, and corrosive sublimate taken internally. But neither of these can be relied on when the symptoms are urgent, and in all circumstances they are greatly inferior to calomel and opium, the soothing and dirigent effects of the opium being of no small importance.

In plethoric subjects, the exhibition of mercury must be preceded by venesection, and accompanied by evacuants and low diet; in anæmic cases it may be given along with the preparations of iron.

Mercury, in one form or other, will require to be continued for a considerable length of time, that not only the iritis may be arrested, and its effects removed, as far as this is practicable, but that the constitutional syphilis also may be completely cured. A removal of the iritis must not be depended on as a proof of the constitution being freed of the syphilitic virus; while, on the other hand, a removal of the constitutional disease, in many cases, is or appears to be effected, although there remains much to be done, and that chiefly by the operation of mercury, before the eye is freed from the iritis and its consequences.

5. *Iodide of potassium.* Cases of syphilitic iritis occasionally occur, where from a variety of cirumstances, such as great weakness of the patient, or severe salivation, the administration of mercury is, for the time, altogether inadmissible. The medicine most to be relied on, in such circumstances, is the iodide of potassium. From 5 to 10 grains may be given, dissolved in water, thrice daily.

6. *Turpentine* has been recommended by Mr. Hugh Carmichael, of Dublin, in syphilitic iritis and other deep-seated inflammations of the eye. The cases which he has related, afford indubitable evidence that this medicine has occasionally removed that species of iritis which is considered as syphilitic; and even after lymph has been effused into the pupil, and tubercles have risen on the surface of the iris, has restored these parts to their perfectly healthy state. It was from the acknowledged influence of turpentine in peritonitis, and from a supposed analogy in point of morbid effects between inflammation of the peritoneum and that of the iris, in both cases a serous membrane being engaged, and in both adhesions being produced between surfaces intended to be free, that Mr. C. was led to use turpentine in iritis. As it is in syphilitic cases chiefly that he has found turpentine useful, he is aware of the objection likely to be started, that this medicine has never been known to possess anti-syphilitic virtues. To this he might have effectively replied, by an appeal to the non-mercurial treatment of syphilis, and to the overpowering testimony of the facts which he himself has recorded. He seems at first disposed, however, rather to chime in with the scepticism of Mr. Travers, who is at a loss to determine whether what is generally considered as syphilitic iritis, is actually a venereal inflammation, or a symptom which merely resembles syphilis, or a disease ingrafted on the syphilitic, or an effect produced by the poison of mercury. But in a more advanced part of his inquiry, Mr. C. declares in favour of the doctrine, that mercury operates in the favourable manner in which it is universally acknowledged to do in syphilitic iritis, not so much by means of any peculiar anti-syphilitic property which it

possesses, as in consequence of its power to excite the action of the absorbents; and this same sorbefacient power he claims for the oil of turpentine. This claim is abundantly vindicated by the cases which Mr. C. has related; and not only so, but he has also demonstrated that this medicine possesses a controlling power over the inflammatory process, upon which the effusion of lymph, in syphilitic iritis, depends.

Although Mr. Carmichael has the merit of having brought forward a new medicine in syphilitic iritis, of unquestionable utility, he is by no means blind to the virtues of other remedies. He acknowledges that the same antiphlogistic and sorbefacient effects which he has derived from turpentine, may be produced in a more decided manner by mercury; while he very properly urges, that the rapidity with which turpentine pervades the body, and consequently brings disease under its influence, together with the absence of fever during its operation on the constitution, must render its use a matter of interest and utility, though the same effects might be accomplished, even in a more decided manner, by other means.

The dose of oil of turpentine is a drachm thrice a-day. Its disagreeable flavour, and nauseating effects, may be obviated by giving it in the form of emulsion. If it induces strangury, linseed tea and camphor julep may be administered, or its use suspended for a time. The tendency to heartburn, which it sometimes causes, may be prevented by an addition of 10 or 15 grains of carbonate of soda to every ounce of turpentine, or every 8 ounces of the emulsion.

When the local inflammation is high, and acute pain present in the eye and side of the head, abstraction of blood ought by no means to be neglected, notwithstanding the statement of Mr. C. that he has frequently, even when these symptoms were urgent, relied solely on the turpentine mixture, and reaped from it the most decided and expeditious benefit. The condition of the bowels will also require attention; the beneficial effects of the turpentine appearing to be suspended when constipation is present, and again called forth when this is removed. Perfect rest, too, if not absolutely necessary, will be found highly conducive to the complete production of the salutary effects of the turpentine. Mr. C. states, that in a few patients who, from their particular situations in life, were obliged to continue in active employment, the same satisfactory results did not follow its exhibition, nor was its influence fully established, until this was attended to.

In some of the cases given by Mr. C. sedatives were employed along with turpentine; such as opium, henbane, and cicuta. These may be exhibited, both internally and externally; and, of course, the application of belladonna ought not to be omitted.

Mr. C. states, that the administration of turpentine has very seldom failed in effecting a perfect cure of syphilitic iritis, and that an amendment has generally been quite perceptible the day after it was commenced. The average period of cure seems, in his hands, to have been about 11 days.

Other practitioners have not reported so favourably of this remedy.

Mr. Guthrie states[3] that "in some cases it has succeeded admirably; in others, it has been of little service; and in some, unequal to the cure of the complaint." Mr. Foote, junior[4], is inclined "to think that turpentine acts by exciting irritation in the intestinal canal and urinary apparatus." He states, that the cases which had been most successful under his observation, were those in which severe strangury was excited. When it was found impossible to produce this kind of irritation, no benefit was experienced.

7. *Sulphate of quina.* Dr. Colles states[5], that if iritis takes place when the system is beginning to throw off a smart salivation, if we have used mercury for the cure of iritis, and produced ptyalism, without effecting much improvement in the state of the eye, or if mercury is not acting in a kindly manner on the system, we cannot attempt to cure the disease by mercury, but must have recourse to other means. He states sulphate of quina to be the remedy which he has most frequently employed under such circumstances, and generally with the happiest effect. He recommends large doses.

8. *Belladonna* is to be painted liberally on the eyebrow and eyelids, night and morning; and when the acute symptoms have subsided, a filtered aqueous solution of it, or a solution of sulphate of atropia, may be dropped several times a-day upon the conjunctiva. This remedy ought to be continued regularly for months, unless the pupil has completely regained its natural freedom and mobility.

9. *Nauseants, sudorifics, diuretics, purgatives,* and *counter-irritation by blisters,* have each their use in syphilitic iritis. Blisters prove highly serviceable after depletion, and after the gums are touched by mercury.

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[1] The appearance of such a cyst, in rheumatic iritis, must be regarded as quite anomalous. I may here mention another appearance of similar character, which I once observed in a case of rheumatic iritis—viz., the whole surface of the iris strewed with red vessels. The case was of three weeks' standing; yet there was no effusion of lymph, and the pupil was regular.

[2] Glasgow Medical Journal; Vol. ii. p. 59; Glasgow, 1829.

[3] London Medical Gazette; Vol. iv. p. 599; London, 1829.

[4] London Medical and Surgical Journal for September 1831, p. 229.

[5] Practical Observations on the Venereal Disease and on the Use of Mercury, p. 165; London, 1837.

SECTION XXII. — PSEUDO-SYPHILITIC IRITIS.

Syn.—Iritis syphiloidea.

It is generally admitted, that there are various diseases, either communicated by impure venereal intercourse, or arising in the system without any communication of that sort, which present a series of morbid phenomena, milder and more rapid in general, but still, in many respects similar to those of syphilis. Till a more accurate description of the diseases in question be obtained, we may be allowed to speak of them as *syphiloid* or *pseudo-syphilitic.*

The pustular eruption spoken of by Bateman, under the name of *ecthyma cachecticum*, appears to be one of the disorders apt to be confounded with true syphilis; and there is no doubt that it occasionally affects the iris, in a manner closely resembling the iritis we have just been considering.

This disease occurs, Dr. Bateman tells us, in connection with a state of cachexia, apparently indicative of the operation of a morbid poison. It much resembles some of the secondary symptoms of syphilis, and is often treated as syphilitic, although there can be no doubt that it originates frequently, if not always, from derangement of the general health, independent of anything like infection.

It generally commences with a febrile paroxysm, which is sometimes considerable. In the course of two or three days, numerous scattered pustules appear, with a hard inflamed base, on the breast and extremities; and these are multiplied, day after day, by a succession of similar pustules, which continue to rise and decline for several weeks until the skin is thickly studded with the eruption, under various phases. For, as the successive pustules go through their stages of inflammation, suppuration, scabbing, and desquamation, at similar periods after their rise, examples of all these conditions are necessarily seen at the same time; the rising pustules exhibiting a bright red hue at the base, which changes to a purple or chocolate tinge as the inflammation declines, and the little laminated scabs form upon their tops. When these fall off, a dark stain is left upon the site of the pustules. The eruption is sometimes confined to the extremities, but it frequently extends also over the trunk, face, and scalp.

The febrile symptoms are diminished, but not removed, on the appearance of the eruption; for a constant hectic continues during the progress of the disease. It is accompanied by great languor, and much depression, both of the spirits and muscular strength; by headache, and pains of the limbs; and by restlessness and impaired digestion, with irregularity of the bowels. There is commonly some degree of conjunctivitis, and the fauces are the seat of slow inflammation, accompanied by superficial ulcerations.

This disease is stated by Bateman to continue from two to four months, in the course of which time, by the aid of vegetable tonics, cinchona, sarsaparilla, serpentaria, &c. with antimonials, and the warm bath, the constitution gradually throws off the morbid condition which gives rise to it. He adds that the administration of mercury is neither necessary to its cure, nor appears to accelerate recovery.[1]

Dr. Monteath tells us that the resemblance of the iritis produced by this eruption to that which is the consequence of syphilis, is so striking, that for several years of his practice he invariably treated the cases he met with, and successfully, by the free use of mercury, believing them to be syphilitic. "The small circle of the iris, and the border of the pupil," adds he, "are often studded with the small reddish-yellow papulæ or pustules, so characteristic of the venereal iritis. It was in consequence of several such cases applying to me with the disease evidently declining, and the pupil clearing, after two or three weeks' continuance, without the patient having taken one grain of mercury, and sometimes almost without any treatment that could have been useful, that I first saw my error, and felt satisfied that these cases were not syphilitic."[2]

Notwithstanding the possibility of this iritis being cured without mercury, and the fact that it is occasionally aggravated[3] by an attempt to mercurialise the system, still an alterative course of this medicine is to be omitted, neither in this nor in any of the other syphiloid varieties of iritis. They will in general yield to such a course, aided by sarsaparilla, local bleeding, blisters behind the ears, the application of belladonna, mild diet, quietude of the general frame, and rest of the inflamed organ. Turpentine, as recommended by Mr. Carmichael for syphilitic iritis, is worthy of a trial in the cases in question.

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[1] Practical Synopsis of Cutaneous Diseases, p. 187; London, 1819.

[2] Glasgow Medical Journal; Vol. ii. p. 138; Glasgow, 1829.

[3] See a case which occurred in the practice of Mr. Arnott, related in the Quarterly Journal of Foreign Medicine and Surgery; Vol. i. p. 78; London, 1819.

SECTION XXIII. — GONORRHŒAL IRITIS.

That the urethral discharge in gonorrhœa is productive, through the medium of the constitution, of synovitis and iritis, has generally appeared so improbable, that the fact has been very slowly admitted by medical practitioners.[1]

The inflammation of the synovial membranes, which arises from gonorrhœa, seldom occurs until the decline of the discharge from the urethra. It affects the large joints, and especially the knees; is attended with copious effusion into the synovial cavities, and a corresponding degree of swelling; and is spoken of under the name of *gonorrhœal rheumatism.* The pain and fever, which attend it, are generally severe, and the cure tedious.[2]

Symptoms.—The iritis which owes its origin to gonorrhœa, may or may not be preceded by synovitis. In general, the inflammation of the eye is very severe. It often commences with redness of the conjunctiva and sclerotica, and a striking haziness of the lining membrane of the cornea. The inflammation speedily affects the anterior surface of the iris, which loses its natural colour. The disease for some days appears to be an aquo-capsulitis. It then merges into an iritis serosa. The pupil becomes contracted, and the vision dim. A profuse effusion of coagulable lymph now takes place, speedily filling the pupil, and sometimes falling down, in a curd-like form, and in considerable masses, into the anterior chamber. In some cases, the anterior surface of the iris is covered with lymph, as if coated with white paint. The anterior chamber is sometimes almost filled with the effused lymph. In fact, no other variety of iritis presents this symptom in the same degree. There is, in general, violent pain in and round the eye, with epiphora and intolerance of light. I have seen considerable chemosis, or conjunctival œdema attend gonorrhœal iritis; but there is no purulent discharge from the conjunctiva. There are no tubercles or abscesses on the surface of the iris, as in syphilitic iritis. The pupil, if the case is left to itself, remains contracted, and adherent to an opaque capsule, with the retina much more sensible, the iris less changed in structure, and the eyeball altogether less thoroughly disorganised, than in syphilitic iritis, but with a great disposition left for relapse.

The patients, who have been observed to suffer from gonorrhœal synovitis and iritis, have generally been young men of scrofulous constitution, who lived hard, and were careless of exposure to cold. Each time the patient catches gonorrhœa, he is liable to an attack of synovitis or iritis, or suffers first from the one and afterwards from the other. In some cases, however, there has been no new gonorrhœa, although a second or a third attack of inflammation has affected the joints or the eye. Over-exertion of sight has sometimes produced a new attack of severe gonorrhœal iritis. Generally one eye only is affected; sometimes the same eye suffers repeatedly. In other instances, first the one eye is attacked, and next time the other is inflamed. Rarely are both eyes affected at once.

The patient is generally troubled with gleet, when the iritis occurs. In some cases, the iritis alternates with synovitis and gonorrhœa, so that when one of them is present, the others are gone. It rarely happens that all three are present at once. In many instances, the patients are harassed for years by a succession of the three, and at last are left in a state of great debility, their sight much impaired, and several of their joints incapable of motion. An eruption (ecthyma cachecticum?) covers in some the scalp and the extremities, and the nails of the fingers and toes are destroyed.

Prognosis.—The gonorrhœal is generally more rapid in its progress than any of the other varieties of iritis, and is one of the most severe and formidable while it lasts; but it yields more promptly to decided treatment than any of the rest, and affords examples of perfect recovery, even when the aqueous chambers are filled with lymph. In no other variety of iritis is the recovery so striking and complete. A first or second attack, energetically treated, gives way readily, and absorption proceeds rapidly, so that it is rarely the case that, under such circumstances, tags are left between the iris and the capsule. The patient often suffers several severe attacks, and yet vision is preserved entire. It is only from very numerous relapses, and when the treatment has been originally mismanaged, that the pupil is left irregular and contracted, and vision permanently deteriorated.

After the lymph in the anterior chamber and within the verge of the pupil is absorbed, a cake of it is sometimes seen lying on the centre of the capsule. This is also absorbed. Although the disposition, then, to an effusion of lymph is greater than in any other iritis, the tendency to organisation of the effused lymph is less than in the other varieties.

Treatment. — Repeated and copious venesection; leeches round the eye; calomel, with opium, in frequent doses, so as rapidly to affect the system; and the application of belladonna; make up the treatment.

If the calomel purges at first, the benefit is augmented; if it does not do so, a dose of castor oil should be repeated occasionally during the treatment. I have treated the disease very successfully with mercurial frictions, after depletion had been freely employed.

The cure of gonorrhœal iritis is not to be trusted to any preparation of iodine, although the synovitis, which it generally follows, and with which it is apt to alternate, is greatly benefited by iodide of potassium, in doses of 8 grains thrice a-day, or by proto-iodide of mercury, in doses of 1 grain thrice a-day, made into pills with liquorice, or, if it acts on the bowels, with catechu.

Counter-irritation, and especially blisters to the temple, do good in this variety of iritis.[3]

Case 281. — Major ——, aged 25, contracted gonorrhœa, in July 1809. In about a fortnight after the appearance of the disease, he was seized with the usual symptoms of hernia humoralis. As these abated, pain and swelling commenced in the right knee; and being at this time under the necessity of travelling in an open carriage for a couple of days, at the end of the journey the pain and swelling had extended to the other knee, and to the foot and toes, especially the articulation of the great toe. Suffering under excruciating pain, and wholly deprived of the use of his limbs, he came under the care of Sir Henry Halford; but no treatment seemed to possess any power in removing the complaint; and in addition, his right eye was suddenly attacked by a very violent inflammation, which threatened destruction to the organ. Having given up the use of medicine, he went to the country for the restoration of his health; and after being there three weeks, the gonorrhœa again increased without any abatement of the other symptoms. The swelling and stiffness of the joints rendered him scarcely able to crawl without assistance. The use of the warm bath and a residence by the sea were recommended. From the former, he experienced little apparent benefit; but after a very tedious convalescence of two years, he found himself able to join his regiment in Spain. From this time he recovered the wonted use of his limbs, and experienced no return of his complaint, though exposed to all the hardships of the campaign of 1812. After exposure to a current of air when in a state of perspiration, he was seized with an intermittent fever, and obliged to return to England. At this time he had some increase of the stiffness of his joints. He continued to suffer from ague, and an impaired state of health, for nearly twelve months, when he returned to the active duties of his profession, and for some time enjoyed perfect health, and the free use of all his joints, till December 1814, when he again contracted gonorrhœa, with symptoms of unusual violence. In a fortnight the discharge began to abate, and violent pain with swelling attacked the great toe and metatarsal ligaments of the right foot. The disease then proceeded to the knees, with the same violence of pain and swelling as on the former occasion. As the violence of the symptoms began to abate in the knees, the left eye was attacked by violent ophthalmia, which excited great alarm for its safety.

Dr. Vetch saw this patient in his convalescence from both the attacks of ophthalmia. The last inflammation of the eye appeared to have had its seat in the sclerotic coat; and on examining it more closely, Dr. V. found an irregular and contracted pupil, with some opacity of the capsule of the lens, and adhesion between it and the iris. On causing him to shut the sound eye, the vision of the left was found very much impaired. Under the use of belladonna and the muriate of mercury, the eye ultimately recovered beyond what Dr. V. had encouraged the patient to expect. Great thickening of the synovial membrane of the knee-joints remained in 1816, and the patient was still incapable of standing or walking. The urethra continued subject to returns of gonorrhœal discharge.[4]

The following particulars of this case are deserving of attention:— On the first attack of ophthalmia, the right eye was the seat of the disease; on the second, the left; in neither was there any symptom of purulency or chemosis, to indicate disease of the conjunctiva; the disease in the urethra was neither suppressed nor modified by the attacks of ophthalmia; the last attack was decidedly one of rheumatic inflammation of the sclerotic coat and iris; an event (Dr. Vetch thinks) of more frequent occurrence, though more liable to be overlooked, in connexion with gonorrhœa, than purulent inflammation of the conjunctiva.

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[1] The urethral discharge in gonorrhœa acts as a virus, infecting the blood. So long as the discharge continues, and still more if a new infection has happened, the patient is liable to attacks of synovitis and iritis. M. Ricord (Lettres sur la Syphilis, p. 30; Paris, 1851) will not admit the slightest resemblance between what he terms *blenorrhagic arthropathy* or gonorrhœal rheumatism, and the symptoms produced in the osseous system by syphilis. No doubt! blenorrhagic arthritis and a syphilitic periostosis or exostosis are different. The one is an inflammation of the synovial membranes produced by gonorrhœa, affecting the constitution as a morbid poison; and the other is an inflammation of the fibrous and osseous tissues, excited by another morbid poison, viz. syphilis.

Gonorrhœal matter, taken from a non-ulcerated mucous surface, produces, on attempted inoculation, no effect similar to what is produced by syphilitic matter. Still, by affecting the constitution, it produces very serious consequences. It leads, not only to synovitis and iritis, but in some instances to inflammation of the serous membranes. In one of my patients it seemed to produce chronic peritonitis; and in another synovitis, followed by inflammation of all the internal serous membranes, with tubercular depositions. Both cases ended fatally.

[2] Swediaur, Treatise upon the Symptoms, Consequences, Nature, and Treatment of Venereal or Syphilitic Diseases; Vol. i. p. 252; London, 1819.

[3] On gonorrhœal iritis, consult Brodie on the Diseases of the Joints; pp. 55, 60; London, 1818: Cooper's Lectures on the Principles and Practice of Surgery, p. 482; London, 1835: Lawrence on the Venereal Diseases of the Eye; p. 53; London, 1830: Graves, London Medical Gazette; Vol. xxiii. p. 440: Lawrence, ibid. p 511: Mayo's Cold Water Cure, p. 25; London, 1845.

[4] Vetch's Practical Treatise on the Diseases of the Eye; p. 195; London, 1820.

SECTION. XXIV.—SCROFULOUS IRITIS.

Syn.— Ophthalmia scrofulosa interna.

The iris is occasionally the seat of *primary* scrofulous inflammation, and a *secondary* scrofulous iritis is by no means uncommon. Cold affecting a scrofulous subject, occasionally brings on a mixed or compound ophthalmia, partly phlyctenular, partly iritic; or at least, we meet with instances in which inflammation of the latter sort so quickly supervenes to the former, that we may regard them as affording examples of *primary* scrofulous iritis. Such cases sometimes assume an acute course, much more frequently a chronic one.

1. The following case, quoted[1] by Dr. Monteath from the journals of the Glasgow Eye Infirmary, affords a good illustration of *acute primary* scrofulous iritis.

Case 282.—Robert Fleminster, aged 16, applied on the 5th August 1827, with sclerotitis and iritis of the left eye, which had resisted remedies for a month. Six leeches were applied to the temple, and he was put on 2 grains of calomel with a quarter of a grain of opium, morning and evening. In eight days, the inflammation was gone, and the sight restored nearly to its natural state. On the 17th, he was dismissed cured. Iritis being of rare occurrence in subjects so young, Dr. Monteath suspected this case, and pointed it out as probably scrofulous. What occurred in the other eye proved the suspicion to be just; for, on the 24th, the patient was re-admitted for an attack of distinct external scrofulous inflammation of the right eye, with pustules and an ulcer at the border of the cornea. The solution of the nitras argenti was had recourse to, two leeches were applied to the temple, and a blister behind the ear, and he was directed to bathe the eye with a very weak solution of corrosive sublimate. On the 27th he was no better, and the colour of the iris was observed to be changed. It was now evident that the inflammation would become iritic, as it had done in the other eye. Four leeches were, therefore, applied to the temple, and the pills of calomel and opium commenced again, as before. On the 31st, the inflammation appeared still advancing, and the iris becoming more affected. The leeches were repeated, and the calomel with opium continued. In five days after this, the mouth was sore, and the inflammation nearly gone. The mercury was now omitted; and, on the 14th September, he was dismissed cured.

The readiness with which this case of acute primary scrofulous iritis yielded to appropriate treatment, is worthy of attention. Whenever iritis is observed in a very young person, scrofula may be suspected as the predisposing cause, the other species of iritic inflammation being rare in childhood. The treatment must be such as was employed in the case just quoted; that is to say, in addition to the treatment demanded by scrofulous ophthalmia, calomel and opium must be given till the mouth is affected. The pupil also ought to be kept under the influence of belladonna.

2. *Chronic primary* scrofulous iritis is characterised by the age of the patients, who are generally children under puberty; its slowness, compared with the progress of the other species; the disease being generally attended with but slight pain, the inflammation in a great measure confined to the serous covering of the iris, and productive of very little lymphatic effusion. In such cases, zonular redness of the sclerotica, greenness and darkness of the iris, and fixedness of the pupil, may often be observed for many weeks together, without any further morbid change, so slow is the progress of the disease. There is also, in many cases, little or no pain or fever, and the patient often sleeps well. At length the pupil is observed to be tagged to the capsule, the capsule becomes partially opaque from effused lymph, while, the disease spreading to the retina, vision is more or less seriously impaired. Allowed to proceed in its course, the disease is now attended with more pain in and round the eye, and sometimes with considerable intolerance of light. The iris bulges forward towards the cornea, the pupil is obliterated, and the cornea and anterior half of the eye become unnaturally convex; myopia, hardness of the eye, and amaurosis follow more or less promptly. In some cases, the eyeball becomes boggy and atrophic. In other cases, inflammation and thinning of the sclerotica supervene.

Chronic primary scrofulous iritis is apt to follow the healing up of porrigo capitis. It is also excited by over exertion of the sight, and by too much exposure of the eye to bright gas-light.

This is a disease not easily cured, especially after it has continued for a considerable length of time. It is not nearly so much under control as rheumatic, or even syphilitic iritis.

Tonics are undoubtedly useful in chronic scrofulous iritis, as in all other scrofulous diseases. Much good will generally be accomplished by change of air, and the use of sulphate of quina. When there is merely intolerance of light, smallness of the pupil, dulness or discoloration of the iris, with zonular redness, without effused lymph or adhesions of the pupil, mercury is not called for, and sulphate of quina is more likely to do good. But it cannot be denied, that against effusion of lymph in scrofulous iritis, mercury is the most effectual remedy, and quina is not to be trusted. When the subject is feeble and feverish, with effusion of lymph into the pupil, sulphate of quina may be given, along with calomel and opium. I lately attended a young man with chronic scrofulous iritis, who derived much benefit from 6 grains of sulphate of quina daily, calomel with opium at bedtime, friction of the head with laudanum and belladonna, and fomentations of the eyes with belladonna and hot water. The iodide of potassium, in doses of 5 grains, thrice a-day, proves useful.

3. A similar plan of cure must be followed in cases of *secondary* scrofulous iritis. We call this variety *secondary*, not only because an inflammation of the cornea is the usual precursor of any affection of the iris, but because the iritis appears to arise more in consequence of the continuance of corneitis or of aquo-capsulitis, and the spread of inflammation from one part of the eye to another, than from any new external or internal cause operating on the iris itself. I have already hinted (p. 527) at the difficulty of discerning, through the inflamed cornea, the exact state of the iris and pupil. Several of the symptoms, also, which attend scrofolous corneitis and iritis, are of an equivocal sort; for the zonular inflammation of the sclerotica, the supra-ocular or circumorbital pain, and the impaired state of vision, are common to iritis, corneitis, and aquo-capsulitis, in their separate state, as well as when iritis is combined with either of the other two. When the opacity of the cornea is not very great, we shall be able, however, to discern at least the size, and degree of mobility possessed by the pupil. If that aperture is contracted, irregular, and motionless, there can be no doubt that iritis is, or has been present. But in many cases, by concentrating the light upon the cornea through a double-convex lens, we may observe even the discoloration of the iris, the tags between it and the capsule, and the whitish web of lymph in the pupil.

Neglected cases of this compound ophthalmia are frequently met with, in which, from the low state of the inflammation and slightness of the pain, the disease has been allowed to go on for years, till at last vision has become almost extinct. A remarkable circumstance in such neglected cases, is the great degree of softness or bogginess which both the cornea and the sclerotica present, on being pressed with the finger. This I regard as a very unfavourable sign; denoting an atrophic condition of the vitreous humour, always attended by a considerable degree of amaurosis.

Whenever iritis is observed to co-exist with scrofulous corneitis, an attempt must be made by mercury and belladonna, to counteract the narrowed state of the pupil, and the effusion of lymph from the iris. From the peculiar constitution of the subjects of this iritis, as well as the chronic nature of the disease, the administration of mercury must be conducted with more than ordinary caution and patience; the gums will, in the first instance, require to be decidedly affected, after which repeated gentle courses of the medicine will be necessary, while the system must be supported during the intervals, by nourishing diet and the use of tonics, and especially sulphate of quina.

We must beware of employing stimulants, with the view of clearing the cornea, so long as there is any suspicion of active inflammation being present in the iris; else we may readily bring on such a degree of irritation, as shall end in annihilation of the anterior chamber, and of course in irreparable loss of sight.

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[1] Glasgow Medical Journal; Vol. ii. p. 132; Glasgow, 1829.

SECTION XXV. — ARTHRITIC IRITIS.

Syn. — Ophthalmia arthritica. Iritis varicosa, *Ammon.*

Fig. Beer, Band I. Taf. II. *figs.* 5, 6. Ammon, Thl. I. Tab. XV. *fig.* 3.

The disease described by the German ophthalmologists under the name of *arthritic ophthalmia*, is known by many remarkable characters, and is unquestionably dependent upon a peculiar state of the constitution. The ophthalmiæ already considered are all of them connected with some appreciable cause; but I must confess, the nature of arthritic ophthalmia is to me unknown. If it is really a gouty inflammation, then gout is a much more frequent disease than the practitioners of this country are disposed to admit, and often occurs among the poor and ill-fed. In this country, gout is a disease rarely recognised in any form, except among the opulent and luxurious; while in the wine countries of the continent of Europe, and especially in Austria, where wine is the beverage of all ranks, gout, and especially what we term irregular gout, seems common, even among the poorest of the people.

It is certain that arthritic iritis rarely occurs in what may be termed the first or plethoric period of gout, that is, while the patients still retain strong powers of digestion, and having the means and the inclination, regale themselves with large supplies of food and drink. It is most apt to occur in the second or asthenic period, after repeated attacks of the disease have produced depression of body and mind, with dyspepsia, flatulence, languor, and irregularity in the excretions.

I have seldom met with this disease in regular gouty constitutions. The subjects have in general been above 50 years of age, of a sallow complexion, in many instances tobacco-smokers and whisky-drinkers, but not always so; they have often laboured under rheumatic affections, been troubled much with headache, bad gums and teeth, acidity, flatulence, and lowness of spirits. While the other iritides occur in textures previously entire, I have often been led to suspect that the peculiarities of the arthritic variety arose from its attacking textures already become defective in sanguineous nutrition, from age and other causes. Not being able to determine the diathesis which predisposes to this ophthalmia, I use *arthritic* as a conventional term, without adopting it in the strict sense of gouty.

The Germans regard abdominal congestion or plethora as the great predisposing cause of arthritic ophthalmia. They trace the plethoric state of the abdominal viscera to heavy meals, and improper food, producing deposition of fat, costiveness, and hæmorrhoids. It is not improbable, that the diathesis on which arthritic ophthalmia depends, is the result of deteriorated digestion. The subjects of this disease are too often dependent on stimulants for their appetite, and for the disposal of their aliment. Their stomach is likely to produce unhealthy chyle, and this to deteriorate their blood; the circulation becomes disordered; inflammatory diseases of unhealthy character ensue, and among these ophthalmia.

Arthritic iritis originates in two ways. In one case, it is the primary and sole affection of the eye; in another, an individual of the peculiar constitution in question being affected with some common ophthalmia, as rheumatic, catarrho-rheumatic, syphilitic, or traumatic, this degenerates into the arthritic. The same thing occasionally happens in regard to the rise of syphilitic iritis. The arthritic originates more frequently in this way than in the other.

Symptoms.—The general symptoms of iritis are present in the arthritic species; namely, zonular sclerotitis, discoloration of the iris, turbidness of the pupil, with changes in its shape, size, and mobility, impaired vision, and pain in and around the eye. These symptoms, however, are associated with some peculiarities, and are modified in such a manner as to afford ground for a ready diagnosis.

1. *Redness.* The conjunctiva is loaded with enlarged vessels as well as the sclerotica. The redness is of a purple hue. The visible arteries of the eye, emerging from the recti muscles, or perhaps rather the accompanying veins, show from the very first a strong disposition to become varicose (*fig.* 52. p. 434), and at length are so strikingly dilated as to form a characteristic symptom of arthritic iritis. The sclerotica loses its natural appearance, and becomes of a dingy grayish-violet colour. Most of these appearances, and especially the livid colour and varicose dilatation of the blood-vessels, are regarded as indicative of a great tendency to atony, which may account for this variety of iritis being much less amenable to antiphlogistic treatment than the others.

2. *Secretion from eyelids.* The epiphora which attends arthritic inflammation of the iris, leads to frequent opening and shutting of the eyelids, by means of which there is forced out from between them a peculiar white frothy matter, which rests upon their edges, especially at the angles of the eye, and which is easily distinguished from any of the ordinary secretions of the conjunctiva or Meibomian follicles. This foam or froth appears, at first sight, to consist of extremely minute globules of watery fluid; but on more attentive observation, it is found to consist of a thickish substance of a sebaceous nature. It has not, I believe, been chemically examined; but it has been hinted that it might contain urate of soda. Mr. Canton has observed, that in proportion as the urine becomes charged with the lithates, this white deposit is lessened in amount at the canthi; and states that where this symptom was present, benefit had been derived from the exhibition of alkalies, with the tincture of aconite and wine of colchicum.[1]

3. *Arthritic ring.* What is strongly insisted on as a diagnostic mark of arthritic iritis, is the existence of a narrow ring of a blueish-

white colour at the edge of the cornea. This ring sometimes does not appear, particularly at the commencement of the disease, all round the cornea, but only at its temporal and nasal sides. The ring in question, which must not be confounded with the *arcus senilis*, is formed by the edge of the sclerotica which naturally overlaps the cornea, and which becomes thicker and more opaque as age advances. In arthritic iritis, it is seen in contrast between the abruptly terminating red sclerotic zone on the one hand, and the transparent cornea on the other. Its importance, as a diagnostic sign of arthritic opthalmia, has been exaggerated; for we sometimes observe it in syphilitic or rheumatic iritis, especially when these occur in subjects far advanced in life.[2]

4. *Changes in the iris and pupil—Glaucoma—Amaurosis—Atrophy of the eye.* Beer has described the changes in the iris and pupil as varying in two different habits of body. I have witnessed, however, both sets of changes in the same individual. In the right eye, a patient whom I saw, presented the contracted pupil; and in a subsequent attack affecting the left eye, the expanded pupil. This difference I conceive to depend on the co-existence of a sensible state of the retina in the one case, and of amaurosis in the other. The retina being sensible, the pupil contracts during arthritic ophthalmia; when the retina is insensible, the inflammation is not sufficient to cause closure of the pupil.

In some individuals, then, the pupil contracts, and, being filled with effused lymph, becomes adherent to the capsule, as is generally the case in the other species of iritis. In such cases, the only characteristic symptom, besides the white ring round the cornea, is a varicose state of the blood-vessels of the iris, so that after the disease has fully developed itself, they may be discerned ramifying on the surface of that membrane, or forming a vascular wreath within the verge of the contracted pupil. The pigment of the iris sometimes seems absorbed in such cases. Fragments of it are often seen sticking to the capsule. Not unfrequently the cornea presents a general state of haziness and roughness, as in corneitis. In one instance which came under my observation, ulceration attacked the centre of the cornea, and penetrated so deep as to expose the internal elastic lamina or membrane of Descemet, which protruding, gave rise to a very large hernia of the cornea. This required to be snipt off, and the ulcer to be touched with lunar caustic, before cicatrization could be brought about. In arthritic iritis, with contracted pupil, if the eye is left to itself, it does not suppurate, but its contents begin to be absorbed, and at last its size is extremely diminished.

In other cases, again, the disease attacks an eye already amaurotic, so that we have a combination of amaurosis with arthritic inflammation. In such cases, the pupil is often expanded only at one or two points of its circumference, so that it assumes an irregular oval shape. The varicose redness of the eye, the frothy secretion on the lids, the white ring round the cornea, and the severe pain round the orbit, are all present, but there is no lymph deposited. The edge of the pupil is often fringed with pigment. The eyeball feels hard, like a stone. The crystalline becomes first of all glaucomatous, and then cataractous.

The subsequent changes which the eye is apt to undergo, are those of which I shall speak under the head of *Glaucoma*.

In the former set of cases, or those in which the pupil contracts, there is reason to believe that, occasionally the vitreous humour being gradually absorbed, a watery effusion takes place between the choroid and the retina, in consequence of which the retina is compressed into the form of a cord stretching from the entrance of the optic nerve to the back of the lens.[4] This state is generally attended by ossification of the choroid. Ossification of the capsule of the lens is also not unfrequent in the atrophic stage of arthritic iritis.

5. *Pain.* It sometimes happens that, before any other signs of arthritic ophthalmia make their appearance, the patient is troubled with peculiar tingling sensations about the eye, and a feeling of creeping over the skin of the face. The eye and the orbit soon become the seat of racking pain, extending to the temple and shooting down into the jaws. While the changes of structure above detailed are going on, attacks of severe pain always occur; they are greatly aggravated in general towards midnight, but in some cases abate but little at any period of the 24 hours. The patient is warned of their approach by a stinging sensation all round the eye, followed by an increased flow of tears; after which, the pain sets in, and becomes, in many instances, so violent, that the patient writhes under it, and utters the most piercing cries of distress. Considerable fever attends the attacks of pain.

Constitutional and exciting causes.—The subjects of arthritic iritis have, in general, been long the victims of various affections of the stomach; such as nausea, vomiting, flatulency, acid eructations, and pains in the epigastrium. Irregular bowels, piles, pains and cramps in different parts of the trunk and extremities, distortion of the small joints, headache, giddiness, an eruption of suppurating tubercles on the face, with lowness of spirits, prevail, more or less, in those who are attacked by this species of ophthalmia. One of the worst cases I have seen, was in an innkeeper who, without being a drunkard, had for many years laboured under a great degree of gutta rosacea. Erroneous plans of diet, a sedentary life, and an indulgence in alcoholic fluids and tobacco, will in general be found to have long been deteriorating the constitution of those who suffer from this iritis.

The local symptoms already detailed, afford sufficient ground for diagnosis. But it may be added, that arthritic inflammation in many instances affects the eye, as it does other parts of the body, without any apparent exciting cause, while rheumatic iritis can generally be traced to some exposure to cold. Arthritic iritis sometimes attacks the patient in the middle of the night, when quiet and warm in bed, arising in fact from no external exciting cause, but from the state of the constitution, influenced perhaps by the digestive organs. Distress of mind often seems the exciting cause.

Prognosis.—The prognosis is more unfavourable than in any of the other species of iritis. A first attack may continue for many months; and though at last the symptoms may yield and a tolerable degree of vision be saved, a renewal of the disease is always to be dreaded, owing to the extreme difficulty, not to say impossibility, of removing the arthritic disposition. A severe attack once a year, or even every two or three years, ends at last in blindness. I have seen the patient, while recovering in one eye, suddenly seized in the other. Besides its obstinacy, there is another circumstance connected with arthritic inflammation of the eye, which renders the prognosis peculiarly unfavourable; namely, the strong tendency which the disease has to affect the choroid, retina, and humours, so that though the attack may for several successive times be confined chiefly to the iris, the rest of the eyeball becomes at length implicated, and vision destroyed.

Cure.—The three most important indications are, to remove the inflammation, subdue the pain, and prevent relapses.

1. Though inflammation be, as Dr. Monteath has well remarked, the proximate cause of all the evils in this species of iritis, as in the traumatic or any other, yet, as it is of an unsound and peculiar nature and dependent on a constitutional cause, it cannot be eradicated by the vigorous use of mere antiphlogistic means. A notion has even prevailed that general bleeding is seldom advisable in arthritic iritis, that it may aggravate the subsequent course of the disease, and that even local bleeding, by cupping and leeches, must be very cautiously employed. I have witnessed, however, excellent effects from general bleeding in this disease. With a full hard pulse, hot skin, and loaded tongue, we need not hesitate to bleed, purge, and administer colchicum; but even when the pulse has not been strong, I have bled at the arm and given mercury, with much advantage. In most cases, the application of leeches to the temple, forehead, and eyelids, will be found advantageous.

The bowels ought to be freely opened by one or more smart doses of calomel and colocynth, followed after some hours by salts and senna. If the tongue still continues foul and the mouth bitter, a common dose of ipecacuan and tartar emetic may be of much service. After this, the bowels are to be kept open by purgatives, and the skin relaxed by some mild diaphoretic.

The vinous tincture of colchicum root proves useful in abating arthritic inflammation of the eye, after bleeding and purging have been employed. Twenty-five drops may be given, every three or four hours.

The free use of mercury is as unsuitable in arthritic iritis as profuse blood-letting. An alterative course of this medicine, however, will be of much service, and may be continued for weeks or months, along with other suitable remedies, so as to change the vitiated habits of the digestive organs. To arrest the morbid action of the capillaries, and check the effusion of lymph, in this iritis, by the sudden introduction of mercury, as in other species of this disease, has been found impracticable. Whether any better effects are to be derived from turpentine, as recommended by Mr. Carmichael, future experience must determine.

I have sometimes derived very striking benefit from the use of the precipitated carbonate of iron, in arthritic ophthalmia, after depletion and mercury had been employed without relief.

Sulphate of quina is another remedy which does good. I have found it very useful, along with Fowler's solution.

Arthritis has been supposed to be analogous to that state of the constitution in which uric acid is deposited from the urine. If this is correct, it affords an explanation of the benefit derived, in gouty cases, from alkaline medicines. These may be tried in arthritic iritis.

Counter-irritation, by blistering and otherwise, is of great service. Beer particularly recommends the bringing out of an artificial eruption by means of tartar emetic ointment. Immersion of the hands or feet in warm water, sharpened with mustard or cayenne pepper, is likely to be beneficial. A gentleman had long suffered from arthritic inflammation of his eye, accompanied by severe pain in the head. Mr. Wardrop recommended him to apply sinapisms to each foot; and being a man of great fortitude, he allowed them to remain on, until so violent an inflammation ensued, that it terminated in ulceration of the skin; but the pain in his eyes and head was completely relieved. Some years afterwards, on Mr. Wardrop's inquiring if he had ever had any return of the inflammation in his eyes, he answered with a smile, that the sinapisms had completely removed it.[5] No patient liable to attacks of arthritic iritis, should be without some permanent drain, such as a pea-issue or cord in the neck.

Dry warmth is almost the only direct application to the inflamed organ, which can at all times be used with impunity. It may be applied by means of several folds of old linen heated at the fire, hung over the eye, and renewed frequently; or the eye may be covered up with carded cotton. Such applications exclude the air, promote an increase of the insensible perspiration, and in this way are of use. Cold applications do harm; and even warm fomentations, with poppy decoction and the like, are not safe, if the parts are left wet and exposed after their application.

2. To moderate and remove as quickly as possible the periodical fits of pain, is a matter of great importance. For this purpose Beer recommends simply opium, moistened to the consistence of a liniment, to be rubbed-in round the orbit. Mercurial ointment with opium and extract of belladonna, laudanum, tincture of tobacco, or volatile liniment, may be used for the same purpose. The friction is to be performed when the evening paroxysm is expected to recur, and repeated during the night if the pain is not prevented, or if it returns at any period of the day or night. The internal use of opium ought if possible to be avoided, till the disordered state of the digestive organs is rectified. Should the pain, however, become very urgent, it cannot be withheld. Considerable relief may also be obtained from the internal use of stramonium, hyosciamus, belladonna, colchicum, and prussic acid, none of which have the same bad effects on the liver and bowels as opium. I have found a vinous solution of the bichloride of mercury with belladonna, a convenient form for exhibiting the latter medicine as a sedative, and the former as an alterative, in this disease. The causes which seem to produce accessions of pain, must be carefully avoided; as, agitation of mind, sudden changes of temperature, &c.

3. Relapses are to be warded off, partly by constitutional, partly by local means.

The constitutional preventive means are partly medicinal, but chiefly dietetical. The general health must be confirmed as much as possible, by proper management of the digestive organs, the kidneys, and the skin. A temperate diet, careful regulation of the bowels by gentle aperients, and a free action of the kidneys, promoted by the use of magnesia or soda water, or of some mild aperient and diuretic mineral water, will be of much benefit. Daily tepid sponging of the body, followed by dry friction, will be of service by promoting an abundant secretion from the skin. The patient should breathe pure country air, and carefully avoiding either to overheat himself, or to cool himself too quickly, should engage in regular and continued exercise of various kinds. If he has long been accustomed to wine, he may be allowed a small quantity of spirits and water.

After an attack of gouty inflammation in the foot, we see the parts continue long tumid, weak, and morbidly sensible, while the most trifling accident, internal or external, is apt to produce a relapse. The same is observed in regard to the eye, only that in this organ we have the advantage of directly witnessing the exceedingly relaxed, varicose, and livid state of the blood-vessels; an indication of how much is wanting to restore the affected parts to their natural tone. After an acute attack of arthritic iritis is subdued, recourse should be had to the use of local applications of a tonic kind. As a means of this sort, the Germans are in the way of using small bags of dried aromatic herbs, suspended over the eye. The bags are made of old linen, and are quilted, so as to keep the herbs equally spread out. The aroma, constantly emanating from the herbs, is supposed to impart a stimulus to the debilitated blood-vessels and nerves. Herbs for the purpose are bruised chamomile flowers, sage, rosemary, marjoram, and the like, with or without the addition of a little powdered camphor. If the exhaled aroma reproduces redness of the eye or aversion to light, this will indicate that the proper time for the use of local stimuli has not yet arrived, and that they must be postponed. Friction round the orbit, once or twice daily, with alcohol, tinctura aromatica ammoniata, or the like, is another local preventive measure which is found of use. Even stimulants to the eye, as vinum opii and red precipitate salve, beginning these preparations in a dilute state, and gradually augmenting their strength, are found to abate the morbid sensibility of the eye, and thus render it less apt to suffer from the ordinary external, as well as internal causes of inflammation. It must not be forgotten, however, that remedies of this kind, used before the acute inflammation is subdued, will, as in every other species of iritis, do harm.

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[1] Medical Times and Gazette, April 24, 1852, p. 428.

[2] See Jones, London Medical Gazette; Vol. xxiii. p. 817.

[3] Cloquet, Pathologie Chirurgicale; Pl. x. fig. 13; Paris, 1831.

[4] See case of C. D. with dissection, by Watson, Edinburgh Medical and Surgical Journal; Vol. xxxv. p. 77; Edinburgh, 1831.

[5] Wardrop's Lectures, in the Lancet, 31st August, 1833, p. 713.

SECTION XXVI. — AQUO-CAPSULITIS.

Syn. — Inflammatio tunicæ humoris aquei. Hydromeningitis tuberculosa, *Hasner*. Keratite ponctuée, *Sichel*.

Fig. Wardrop, Pl. VIII. *figs.* 1, 2. Beck, Taf. I. *fig.* 2. Dalrymple, Pl. XVII. *figs.* 2, 3, 5, 6. Sichel, Pl. VI. *figs.* 1, 3.

By *aquo-capsulitis*, a disease first described by Mr. Wardrop in 1808, is meant inflammation of the parietes of the aqueous chambers, and especially of the membrane which lines the internal surface of the cornea, and is partially continued in the form of fine fibres into the anterior surface of the iris. The membrane in question is known as the membrane of Descemet, or posterior elastic lamina of the cornea. It is a uniform, transparent, homogeneous layer, scarcely $\frac{1}{2000}$ inch thick, and is covered, on its internal surface, by a single series of flat, epithelial, nucleated particles, constituting the only true epithelium in contact with the aqueous humour. The front neither of the iris, nor of the lenticular capsule, has any epithelium. Although it is, therefore, incorrect to speak of the anterior and posterior chambers as lined by a shut sac or serous membrane, or of the aqueous humour as contained within a proper capsule, the name *aquo-capsulitis*, with these explanations, may still be retained, to designate a very distinct disease.[1]

We sometimes meet with this ophthalmia in the acute form, when it is attended with very considerable redness of the sclerotica and conjunctiva; much oftener in the chronic, when a peculiar sort of opacity of the cornea is one of the most remarkable symptoms. The subjects of it are mostly adolescents or children, although I have seen it in adults, and even in old people.

Symptoms. — 1. In the acute form, aquo-capsulitis looks like a partial rheumatic ophthalmia, the redness consisting chiefly in an incomplete sclerotic zone, sometimes pretty intense. The conjunctival vessels are also frequently enlarged.

2. The external surface of the cornea is at first perfectly clear and glancing, but its lining membrane soon appears more or less dim or opaque. There is at the same time a muddiness in the anterior chamber, and occasionally an appearance as if the eyeball were unusually full and prominent. This must arise from an increase in the quantity of the aqueous humour, the balance of action being suspended, which naturally exists between the exhalents and absorbents of that fluid, or may depend on an effusion of serum from the surrounding blood-vessels. In more severe cases, coagulable lymph is effused from the lining membrane of the cornea; and if the iris, which is often the case, partakes in the inflammation, this effusion may become the medium of adhesion between the iris and the cornea. More frequently, however, the iris becomes tagged to the crystalline capsule, and the pupil thereby rendered irregular.

Besides the diffused muddiness, there are often present in this disease, and especially in its chronic stage, a number of circumscribed milk-like spots on the internal surface of the cornea, which even the least experienced may readily distinguish from any of the superficial opacities of that part. These spots are often very numerous, and affect most the lower half of the cornea, giving it a mottled appearance, and forming by far the most characteristic mark of this ophthalmia. Mr. Wardrop has accurately described their more opaque central points as surrounded by a kind of disk, so as to resemble what is called the eye of a pebble. He seems to ascribe the whiter point in the centre to opacity of the substance of the cornea, and the disk to that of the lining membrane.

These punctiform depositions of lymph, which are often so small as to require the aid of the ophthalmic microscope to make them out, I have seen very distinctly in many cases. What was very remarkable in one case, the spots partially appeared and disappeared, even in the space of a few hours, so that the patient saw worse in the morning when most of the spots were observed, and better towards the evening when those at the upper part of the cornea had considerably diminished. In this case there was a general turbidness observable in the morning. The whole appearance of the anterior chamber, and of the spots in question, resembled very much the effect which might be supposed to be produced, had a quantity of minute drops of ammoniated oil been mingled with the aqueous humour, and allowed to deposit themselves on the internal surface of the cornea. This state of the cornea was the consequence of pretty severe inflammation, about nine months before, in a patient who had long been troubled with rheumatism.

The depositions in question are regarded by Hasner as tubercular, and as situated in the epithelium. The membrane of Descemet he states never to present any opacity on dissection.

3. During the continuance of the inflammatory symptoms, there is generally so much muddiness diffused over the whole anterior chamber, that no distinct portions of effused lymph can be distinguished, unless they be of large size; but when this turbid state goes off, flakes of lymph may sometimes be perceived, and in other instances, the whole surface of the inflamed membrane is left covered by a thin layer of it. In some cases, the effused lymph floats in the anterior chamber, appearing like a thick cloud; in other cases, it is deposited in streaks, so as to present a reticulated appearance; and in others it resembles a purulent fluid. If the effused lymph be not afterwards absorbed, it is apt to become organised; and not unfrequently red vessels can be seen ramifying through it, either along the internal surface of the cornea, or over the iris into the pupil.

4. Gierl and Ammon[2] have observed, that, in this disease, opacity of the external surface of the cornea is often a sympathetic effect of inflammation of its lining membrane. A spot of effused lymph being visible on the internal surface of the cornea, red vessels are, by and by, seen coursing over its external surface to the corresponding point, and there becoming the source of an opaque deposition.

5. The iris gets discoloured almost from the first. Whitish spots, like those on the inside of the cornea, are described as appearing on it, and also on the surface of the crystalline capsule. In some cases, the dropsical state of the aqueous cavity is such that the iris is bent back into a funnel form. There sometimes attends this disease an increased flow of tears, but the patient in general does not suffer

much from exposure to light. What is particularly to be noted is a sensation of distention and fulness in the eyeball, accompanied with a dull aching pain, generally in the forehead, sometimes also in the back part of the head; symptoms which Mr. Wardrop assures us are instantly and permanently relieved by evacuating the aqueous humour. In some cases, the pain is severe, pulsative, circumorbital, and nocturnal.

6. The constitutional symptoms vary much in severity. Sometimes the pulse is frequent and hard, the skin hot and dry, the tongue loaded, and the functions of the alimentary canal disordered. In other cases, the disease almost from the commencement assumes a chronic form, and after continuing a certain period, participates in any peculiarity of the patient's constitution, and becomes thereby modified, the most frequent modifying cause of this kind being scrofula.

Diagnosis. —The turbid state of the aqueous humour, and the hazy condition of the lining membrane of the cornea and anterior capsule, render the two deep images obscure. They again become distinct as the disease subsides. Aquo-capsulitis is sometimes mistaken for amaurosis; but by examining the eye through a lens of short focus, or through Gulz's ophthalmic microscope, and by using the catoptrical test, the diagnosis becomes easy.

Causes.—Long-continued over exertion of the eyes, and suppressed perspiration, are causes to which I have traced this disease. Slight blows on the eye, and exposure to cold, have been known to produce it. In one case which I saw, the irritation arising from a decayed tooth seemed the cause. The disease declined rapidly after extraction of the tooth.

Treatment.—In the acute stage, I have found the treatment for iritis completely successful; viz. depletion, mercury, and belladonna.

Emetics and nauseants, purgatives and counter-irritation, have been recommended, and in some instances a cure has been effected by these means, without the use of mercury.[3]

This disease presents itself much more frequently in the chronic than in the acute form, and in subjects in whom much depletion could not be borne. A combination of tonics and alteratives answers best under these circumstances; such as a blue pill every second night, with rhubarb and sulphate of quina twice or thrice a day. Sulphate of quina, with a small quantity of calomel, continued in repeated doses through the day, till the gums become touched, answers well.

Vinum opii, pure or diluted, is one of the best local applications after the disease has somewhat subsided. Exposing the eye to the vapour of hydrocyanic acid, for a few minutes daily, aids in clearing away the opaque depositions from the cornea.

In the cases recorded by Mr. Wardrop, in the fourth volume of the Medico-Chirurgical Transactions, benefit appears to have been derived from cupping the temples, purging, fomenting, and the application of such stimulants as murias and nitras hydrargyri in solution, red precipitate salve, and sulphuric ether. Mr. Wardrop, however, places most reliance on evacuation of the aqueous humour, stating that there is no inflammation of the eye, in which so much benefit is derived from that operation, as when the disease affects the internal layer of the cornea. He had never found it fail in procuring immediate relief of the pain of the head, and instantaneous restoration of the transparency of the anterior chamber.

Much benefit is obtained from leaving the confined air of the town, and going into the country.[4]

SECTION XXVII. — CHOROIDITIS.

Syn.—Ophthalmitis arthritica, *Rosas.* Acute glaucoma. Arthritic inflammation of the internal tunics, *Lawrence.* Retinitis and glaucoma, *Tyrrell.* Arthritic posterior internal ophthalmia, *Jones.* Amaurosis glaucomatosa.

Fig. Jones, Pl. II. *fig.* 3.

In the choroid and iris, almost the whole of the red blood of the eyeball is concentrated. There is little in the sclerotica, not a great quantity in the retina, and none in the cornea, crystalline, or vitreous body. The transparency of the refractive parts of the eye forbids that they should be traversed by red vessels; and were such vessels large and numerous in the retina, its sensibility would necessarily be interfered with. To render the iris and choroid opaque, and thus to secure the passage of light into the eye only by the pupil, as well as to prevent its reflection after it has entered and has struck the retina, the iris and choroid are provided with the power of secreting from the red blood with which they are so amply supplied, the pigment which is at once infiltrated into their substance, and deposited so copiously in their internal epithelium. Added to this, the ciliary body, which is a part of the choroid, is charged, through the medium of the zonula Zinnii, with the nutrition of the vitreous body and the lens. The only part of the choroid which is provided with nerves, is the choroid muscle, or orbiculus ciliaris. The ciliary nerves, which lie imbedded on the inner surface of the sclerotica, go to the choroid muscle, and thence to the iris. To the high vascularity and nervous irritability of the iris, we may attribute its great proneness to inflammation; while the choroid, although extremely vascular, from possessing scarcely any sensibility, is but little liable to inflame.

Though choroiditis be fortunately not a frequent disease, it is a very severe one. We can readily conceive what must be the effects of inflammation of the choroid. Its vessels becoming congested, and the membrane thereby swollen, it will necessarily press outwards on the ciliary nerves and on the unyielding sclerotica; and the conse-

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[1] On the structures forming the aqueous chambers, consult Bowman's Lectures on the parts concerned in the Operations on the Eye, p. 19; London, 1849; on their pathology, Hasner's Entwurf einer anatomischen Begründung der Augenkrankheiten, p. 103. Prag. 1847.

[2] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde, Vol. xiii. p. 114; Berlin, 1829.

[3] Praël, in Ammon's Zeitschrift für die Ophthalmologie; Vol. iii. p. 42; Dresden, 1833.

[4] On aquo-capsulitis, consult Wedemeyer, Langenbeck's Neue Bibliothek für die Chirurgie und Ophthalomologie, Vol. iv. p. 66; Hannover, 1823: Bedford, Guy's Hospital Reports, Vol. vii. p. 359; London, 1842: Watson, Edinburgh Medical and Surgical Journal, July, 1845, p. 98.

quence will be severe pain in the eye. The swollen choroid will also press inwards on the retina, and produce, only in a much greater degree, and not momentarily but without interruption, the same effect as we find to arise when with the finger we make pressure externally on the eyeball, namely, flashes of light and flaming spectra. The continued pressure on the retina may obliterate the sensibility of that structure to the impressions of light from without.

These are evidently the primary effects which will arise from inflammation of the choroid. As the disease advances, to the accumulation and stagnation of red blood in its vessels will be added exudation from its surfaces, especially its internal surface, on which the capillaries are distributed; effusion of serum, which will add still more to the pressure produced by the turgid state of the membrane; effusion of fibrine, binding its surfaces, one or other, or both, to the contiguous textures; and formation of pus, breaking up the finer elements of the retina, which lie so closely in connection with the choroid epithelium. Into the hyaloid, also, exudation will take place from the ciliary body, changing the nutrition of that structure, and affecting the constitution and transparency of the lens.

§ 1. *Acute Choroiditis.*

Symptoms.—Acute choroiditis generally begins with the sudden occurrence of severe throbbing and darting pain, in the eyeball and corresponding half of the head, coming on in fits, and much increased during the night. The eye feels stiff, and there is a sense of fulness and distension in it, accompanied with such excessive tenderness that the patient cannot touch it, much less allow it to be touched. He complains of frequent flashes of vivid, reddish, or orange-coloured light, even when all external light is excluded, or of a luminous spot in the axis of vision, increased by every thing which quickens the circulation, such as taking food, or making the slightest exertion. The eye is suffused with tears, and is highly intolerant of any exposure to light.

If we succeed in such a case, in obtaining a view of the eye, we generally find the redness of its external coverings much less than might have been anticipated from the sufferings of the patient. The white of the eye is of a dingy yellowish colour. The reticular and zonular injections of the conjunctival and sub-conjunctival networks is very variable in degree, never excessive, and often slight. By and by, the large exterior vessels of the eye assume a strikingly varicose appearance, and are seen winding over the sclerotica, and anastomosing round the cornea. (*Fig.* 52, p. 434.) They are of a livid hue, and evidently in a state of passive congestion.

The edge of the cornea presents the bluish-white ring, which arises from the over-lapping of the sclerotica. The cornea generally is more or less hazy, and often seems slightly rough. At first the pupil is contracted, but without any lymphatic exudation. The iris assumes a slate colour; and the pupil, fringed with pigment, becomes dilated, mishapen, often oblong, displaced, and motionless.

I have known an attack of acute choroiditis to occur suddenly during the night, and in the course of a few hours totally to abolish the sensibility of the retina. In such a case, vision is rarely recovered, even although the redness and pain of the eye are overcome. In other instances, vision is first dull and misty; and the seeming mist rapidly increasing, in a few days the eye is left completely amaurotic.

The subjects of the disease are generally past middle life, much oftener females than males, of a dark complexion and sanguine temperament, and more frequently dark than light eyed. They are not unfrequently myopic, and often present that dichromatic state of the crystalline, which is called *glaucoma*, in which it reflects the incident light of a greenish hue. As the disease goes on, the glaucomatous degeneration increases, the lens appears pushed forward into the dilated pupil, and after a time it is apt to become cataractous. When the finger is placed on such an eye, it feels as hard as a pebble, indicating that serous effusion has taken place into the vitreous body, augmenting the contents of the eyeball beyond their normal quantity.

From this condition, the eye never recovers. The pain may relax, and the eye become quiet, and ultimately atrophic. On the contrary, the disease may go on to manifest the further disorganising changes of chronic glaucoma. On dissecting an eye which had become atrophic from choroiditis, I have found scarcely any trace of the internal structures in a normal state, the sclerotica and choroid being adherent, copious deposits of organised fibrine covering the internal surface of the choroid, and the retina no longer recognisable.

In some instances, the internal disorganisation is accomplished less by fibrinous, than by serous effusion. In this case the united choroid and sclerotica, unable to support the contents of the eyeball, expand, and become attenuated, so as to form one or several staphylomatous elevations.

There is reason to believe that, in some very acute cases, almost the whole extent of the choroid is inflamed. These are attended with the most severe symptoms, and with total and sudden abolition of vision. The disease may be confined to the posterior part of the choroid, and then photopsia and loss of vision are the most prominent symptoms. It is in such cases that we sometimes see a change in the colour of the fundus oculi, from a fibrinous deposit between the choroid and retina, the anterior part of the choroid remaining comparatively free, and thus the lens suffering less from the disease.

Considerable constitutional disturbance attends acute choroiditis. The patient is in a perpetual state of restlessness, and is greatly alarmed for the total loss of sight. The pain entirely prevents sleep. The head is so tender that it cannot be laid on the pillow. The face is flushed. There is giddiness and nausea. The tongue is foul, the mouth parched, and there is much thirst. The pulse is quick and hard. I have known the long-continued pain and want of sleep wear out the patient, and thus lead to a fatal termination.

One eye often suffers alone from acute choroiditis. In other cases, the eyes are attacked in succession; very rarely together. In one case, some years after one eye had been affected, I saw the other become amaurotic, with irregularly dilated pupil, but without pain or redness.

Causes.—1. Exposure to a draught of cold air, while perspiring. 2. Over use of the eyes on minute objects. 3. Mental anxiety, grief, and want of sleep. 4. The sudden suppression of some long-continued discharge, such as that from hæmorrhoids.

These are the causes to which the disease is oftenest to be traced. In one woman whom I saw, it occurred after typhus fever, without any other cause which could be assigned.

Treatment.—1. Blood must be taken from the arm, or from the temporal artery, followed by cupping and leeches. The degree to which depletion is carried, and the form in which it is employed, must be regulated by its effects and the constitution of the patient.

2. A dose of calomel should be given at bedtime, followed by a purgative next morning. This may be necessary more than once, after which a mild mercurial course ought to be commenced. Mercury must not be pushed too far. It has not the same control over choroiditis which it has over iritis, nor are the patients so able to withstand its depressing effects.

3. Opiates are necessary, internally and externally, to overcome the pain.

4. The usual counter-irritating means are not to be neglected.

5. The various secretions ought to be brought into as healthy a condition as possible, especially those of the liver, kidneys, and skin.

6. In tranquillising the system, much advantage is obtained from the use of sarsaparilla, after which a course of bitter tonics will be found advantageous.

7. Paracentesis of the cornea, or of the sclerotica, affords great relief to the pain. Atrophy of the eye sometimes follows puncturing the sclerotica, and, if vision is already extinct, is a desirable termination of the disease.

§ 2. *Chronic Choroiditis.*

Instead of occurring suddenly, with severe pain, and perhaps instantaneous blindness, the symptoms in the chronic variety succeed each other slowly and insidiously. Iridescent vision, and the sensation of undulating or whirling circles of light, come to be associated with gradual deterioration or even abolition of vision. Pain is felt in and above the eye, and in the forehead and temple. Varicose vessels, of a livid hue, appear on the surface of the sclerotica and on the iris, while glaucoma commences its usual slow but certain course of disorganisation, accompanied with an irregularly expanded or distorted pupil. The eyeball is hard, which is the reverse of what happens in retinitis, where the cornea and sclerotica are flexible. Photopsia often continues, after all perception of external light is extinct.

To revert again to the anatomy of the choroid, while its inner surface forms in front the black plicated circle, called the corpus ciliare or ciliary processes, adhering to the zonula Zinnii of the hyaloid, it presents on its outer surface the whitish ring called orbiculus ciliaris or ciliary ligament, now generally recognised as a muscular structure, the anterior edge of which serves to unite the choroid to the sclerotica. That both the corpus ciliare and the choroid muscle suffer in choroiditis, can scarcely be doubted. There is even reason to think, that sometimes the one, and sometimes the other may be the seat of inflammation, independently of one another, or of the rest of the choroid coat. Inflammation of the orbiculus ciliaris has indeed been particularly described by Dr. Ammon[1], who mentions its being attended with a vascular elevation of the conjunctiva over the junction of the sclerotica and cornea, its frequent connection with symptoms of aquo-capsulitis, and its leading occasionally to sclerotic staphyloma. It is by no means probable that the same symptoms will attend inflammation of the ciliary processes and that of the ciliary ligament, and it is sufficient to show that the observation of these affections of different portions of the choroid is as yet only in its infancy, that Dr. Hasner[2] has lauded Dr. Ammon's description, as one of inflammation of the corpus ciliare, whereas it refers only to that of the orbiculus ciliaris.

The subjects of chronic choroiditis, like those of arthritic iritis, are often affected with symptoms of irregular gout. They have suffered from a generally depressed state of health, have a feeble pulse, their appetite is deficient, and they are troubled with nausea, flatulence, and other signs of gastric derangement.

In such subjects, depletion is rarely required. Mild alteratives and tonics, long-continued, seem most beneficial. The regular use of the warm foot-bath, with mustard or cayenne pepper infused in the water, proves of service.

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[1] Rust's Magazin für die gesammte Heilkunde, Vol. xxx. p. 240; Berlin, 1830: Zeitschrift für die Ophthalmologie, Vol. ii. p. 194; Dresden, 1832.

[2] Entwurf einer anatomische Begründung der Augenkrankheiten, p. 158; Prag, 1847.

SECTION XXVIII.—IDIOPATHIC RETINITIS.

Syn.—Ophthalmitis interna idiopathica proprie sic dicta, *Beer.*

Fig. Beer, Band II. Taf. I. *fig.* 5.

It is easy to understand that the internal inflammations of the eye, as they originate from causes which affect the organ in very different ways, may arise sometimes in one texture, and at other times in another; that in one case the retina shall be first affected; in another, the choroid; in a third, the iris. The inflammatory action, however, is seldom, if ever, confined to the part first affected. We have already seen how inflammation, originating in the iris, spreads to the sclerotica, and to the choroid; and how choroiditis affects the textures both within and without the choroid. In the same way, inflammation commencing in the retina is likely to spread inwards, to the vitreous humour, to the capsule of the lens, and to the lens itself; outwards, to the choroid and iris, to the sclerotica and cornea, and to the conjunctiva. Thus an inflammation of the whole eyeball may have a very limited origin.

Although the retina possesses a considerable degree of vascularity, the amazing fatigue which it sustains without injury, shows that it is not very susceptible of inflammation. It is insensible except to light, and therefore, when inflamed, no pain is experienced, unless the inflammation extends to other textures of the eye. As the ramifications of the central artery of the retina lie near its concave surface, the exudation which may follow the congestive stage of retinitis, will generally take place between the retina and the vitreous body; and, even when limited in extent, will cause obliteration of vision. When lymph or pus is effused on the convex surface of the membrane, the pressure is likely to produce photopsia. Should the choroid and iris get involved in the inflammation, the ciliary nerves being pressed upon, will cause pain, more or less acute, in and round the eye.

The morbid anatomy of the eye proves distinctly that the retina suffers in various ways from inflammation; for it sometimes presents the appearances of greatly increased vascularity, its surfaces are found loaded with lymphatic or with purulent exudation, its colour is changed, it is adherent to the choroid or the hyaloid, its tissues are hypertrophied or atrophied, loaded with calcareous matter, &c.[1]

The accounts given by authors, of the symptoms of inflammation of the retina, are remarkably discordant. This arises, in some instances, from diseases altogether different from one another, except in so far as they speedily end in loss of vision, being designated by the name of *retinitis.* There seems reason also to believe, that inflammation of the retina is in some cases accompanied by hyperæsthesia both of the optic and of the fifth nerve, while in general no such complication is present. When hyperæsthesia of these nerves exists, the patient is tormented by intolerance of light, photopsia, exquisite sensitiveness of the organ of vision to the touch of the finger, and paroxysms of dreadful pain, all which symptoms may occur, without any retinitis; while, on the other hand, vision may be speedily extinguished by inflammation of the retina, without any manifestation of exalted sensibility.

Some of the causes to which retinitis is generally ascribed, are rather such as we should judge likely to produce this effect, than causes which have been completely traced in their operation. As a sequela of a peculiar variety of remittent fever, and as a sympathetic or reflex effect in the one eye, from traumatic disorganisation of the opposite eye, retinitis occurs much more markedly than from exposure of the eye to vivid light, or from overworking of the organ of vision. In both the cases, however, now referred to, it occurs only as the commencement of a disease which at last involves all the tissues of the eye.

§ 1. *Acute Idiopathic Retinitis.*

Symptoms. —1. In the commencement of the disease, the external appearances of inflammation are very slight. There may be little or no redness, or only a trifling degree of zonular injection round the cornea. As the disease advances, the redness round the cornea increases, and affects both the conjunctival and the sclerotic network.

2. In acute retinitis, the inflammation is never long confined to

the retina, but speedily spreads to the other vascular textures within the eye, to the choroid, and especially to the iris. The iris changes colour, assuming most frequently a greenish hue, while a deposit of pus takes places between its lower edge and the cornea. The nutrition of the lens being disturbed by the implication of the corpus ciliare and zonula Zinnii, capsulo-lenticular cataract ensues.

3. The pupil generally becomes contracted; but sometimes it is dilated. Its motions are always performed slowly and imperfectly, however great the alternations of light to which the eye is exposed. A reddish wreath is sometimes seen within the pupil. Lymphatic exudation glues it to the capsule.

4. If the pupil continues patent and the lens clear, a yellowish deposit is sometimes visible at the bottom of the eye, fixed, as if lying on the retina, or waving, as if loose in the vitreous humour.

5. The eyeball, and especially the cornea, becomes flaccid, yielding to the slightest pressure of the finger, evidently showing a diminution to have taken place of the natural quantity of vitreous fluid.

6. Vision is speedily affected. In acute cases, it is abolished in the course of not many hours. Brought under the influence of proper remedies, it returns slowly, never suddenly.

7. If the disease is limited to the retina, there may be no pain in the eye. The patient generally complains of considerable headache, and when the choroid and iris become implicated, circumorbital pain is experienced.

8. If vision is preserved, the patient complains greatly of muscæ volitantes. We should *à priori* expect fixed muscæ, but such rarely occur.

Diagnosis.—Not only does retinitis bear a resemblance in many respects to some of the other ophthalmiæ, but, as I mentioned when entering on the consideration of iritis, a degree of inflammation of the retina always accompanies inflammation of the iris. The disease, however, with which retinitis has been oftenest confounded, is hyperæsthesia of the optic and fifth nerve, in which there is excessive sensibility to light, with spasm of the orbicularis palpebrarum, pain in and round the eye, and great sensitiveness of the eyelids and eyeball to the touch. Vision, during this affection, is almost null, because the organ cannot be put to use; the disease may continue for a great length of time; the recovery is generally sudden and complete. Pure retinitis, then, and ocular hyperæsthesia, are easily distinguished. In some cases, however, there is reason to believe, that an exalted sensibility of the fifth nerve is combined with inflammation of the retina, so that the symptoms are of a mixed description. In pure ocular hyperæsthesia, there is no redness of the eye, the pupil is clear, the iris lively, the retina perfectly sensible. That photophobia is not to be received as a sign of inflammation of the retina, is shown by what we see in scrofulous ophthalmia; a disease in which, though the influx of light is intolerable, on dissection the retina shows no appearance of increased vascularity.[2]

Causes.—Retinitis sometimes arises from causes of very limited and transient action.

It occasionally follows long-continued straining of the sight in the examination of very small, perhaps microscopical, objects, under a strong light reflected into the eye, either immediately from the object of examination, or from a speculum. In such cases, however, there are commonly certain predisposing causes, which ought not to escape observation; such as a state of general phlethora, or a tendency to determination of blood to the head.

Vivid flashes of lightning sometimes excite inflammation of the retina, which has also frequently been brought on by imprudently viewing an eclipse of the sun. Prisoners long confined to the darkness of a dungeon, have been seized with inflammation of the retina on being brought suddenly forth into the full glare of day. Travelling over a tract of country covered with snow has been known to produce the same effect. Saint-Yves notices the case of a man who became blind in consequence of going too close to the light and heat of a strong fire, in attempting to tie a string to a fowl turning on the spit; and another of a workman in the mint, who lost his sight from the brilliant flashing to which he was exposed, while pouring metal into a red-hot crucible. Both of these accidents were probably owing to retinitis. Several cases are recorded, in which the disease occurred in cooks.

To blind one was, and still is, in some countries, a mode of punishment. The person is compelled to look on a concave mirror of polished steel, held opposite to the sun. This will excite speedy inflammation of the retina, and certainly end in a greater or less degree of insensibility to light. Some such method must be employed in India at this day, as many of the native princes, condemned to the loss of sight by the jealousy of their rivals, but suffered to live in a state of captivity, are said to have no appearance, at a little distance, of being blind.

Prognosis.—The prognosis in retinitis is not unfavourable, if a proper method of treatment be commenced before the pupil is much contracted, or the power of vision greatly impaired. If vision seems already extinguished, the prognosis is extremely unfavourable. If the pupil be once closed, even before the retina appears to have become insensible, there is scarcely any hope of preserving sight; for even should the pupil re-open in some degree, as it occasionally does on the inflammatory symptoms abating, yet it remains small and motionless, and the eye is still blind.

Treatment.—Complete rest of the eyes and of the whole body, darkness, abstinence, and active depletion, followed by the rapid introduction of mercury into the system, are the means to be depended upon in retinitis.

Copious blood-letting from the arm is to be immediately followed by a plentiful application of leeches round the eye. Should the symptoms not yield, the jugular vein or temporal artery ought to be opened, and an additional quantity of blood abstracted.

Calomel with opium ought to be given in frequent doses, till the mouth is affected.

Belladonna is to be applied in the usual way.

Should a small quantity of matter be present in the anterior chamber, we must on no account let ourselves be induced to open the cornea; but trust to the sorbefacient effect of the mercury, assisted by blisters behind the ears or on the back of the neck.

The treatment, then, of retinitis is essentially the same as that formerly recommended for iritis. The same advantage will probably be derived from the substitution of iodide of potassium for mercury, when we are obliged to intermit the latter medicine; and the preparations of cinchona will be had recourse to, should debility of the patient indicate the use of tonics, in the stage of convalescence.

§ 2. *Chronic Idiopathic Retinitis.*

Chronic cases of retinitis not unfrequently present themselves to our observation, characterised by sluggishness of the pupil, muscæ volitantes, ocular spectra, obscurity of vision, dryness of the eyes and Schneiderian membrane, followed after a time by flexibility of the cornea. There is reason to think that the disease ends in atrophy of the retina and optic nerve. It is probably the most frequent cause of amaurosis.

Watchmakers, jewellers, and those who spend a great part of the day and night in reading and writing, are apt to be affected in this way; also tailors, milliners, mathematical instrument makers, printers, and engravers, with many other classes in whom the eyes are excessively fatigued. Those who indulge in ardent spirits, or who habituate themselves to the use of tobacco, are also frequently affected with chronic retinitis.

The Esquimaux, inhabiting Hudson's Bay, are well aware of the loss of vision which arises from constantly viewing a country covered with snow. They make use of a kind of preservers, which they term *snow-eyes.* These consist of two pieces of wood or ivory, so formed as to fit the eyes, which they completely cover, and are fastened behind the head. Each piece presents a narrow slit, through which every thing is distinctly seen.[3] This invention preserves them from the snow-blindness, which is apt to be occasioned by the strong reflection of the sun's rays; and which, it is probable, is the effect of slow inflammation excited in the retina.

Treatment.—Cases of chronic retinitis are often injured by stimulant and tonic treatment, while, on the other hand, they are greatly benefited by moderate and repeated depletion. A gentle course of mercury is also of use. Counter-irritants sometimes seem hurtful. The eyes must be spared, bad habits abandoned, and the patient, if it be in his power, should try the effects of country air and exercise.[4]

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[1] See Wardrop's Morbid Anatomy of the Human Eye, Vol. ii. p. 153; London, 1818: Ammon's Klinische Darstellungen der Krankheiten des menschlichen Anges, Thl. i. Taf. xix. xx.; Berlin, 1838.

[2] Langenbeck de Retina, p. 163; Gottingæ, 1836.

[3] The snow-eyes also increase the powers of vision, so that the Esquimaux, when desirous of viewing any thing at a distance, mechanically apply them to their eyes. Different accounts are given of the slit or slits in these instruments; for some tell us there is only one in each eye-piece, and that it is long and narrow, while others say that there are two, about a quarter of an inch long. This is probably regulated by the fancy of the wearer.

[4] On Retinitis, consult Hocken, Transactions of the Provincial Medical and Surgical Association, Vol. xiii. p. 241; London, 1845.

SECTION XXIX. — RETINITIS FROM UNDUE LACTATION.

Syn.— Retinitis lactantium.

The attention of practitioners is often called to imperfect vision, or what the patients style *weakness of the eyes,* in women giving suck. The most momentous part of the disease is really a chronic inflammatory state of the retina. Almost all the other tissues of the eye, however, may be involved, so that it might almost be set down as an ophthalmitis, were it not much more apt to terminate simply in amaurosis, than in any such general disorganisation of the organ of vision as occurs in those inflammations to which the name ophthalmitis ought to be appropriated. Mr. Middlemore describes[1] the disease as affecting chiefly the edges of the eyelids and the conjunctiva, and designates it by the name of *irritable ophthalmia.* Dr. Nasse[2] considers it chiefly as an inflammation of the cornea. Dr. Ashwell refers[3] to the affection as an amaurosis.

Symptoms.—The disease may affect one eye only, but commonly both eyes suffer from it. There is an evident general irritation about the organs of vision. The eyelids are somewhat swollen, and their edges red. The conjunctiva, and especially the palpebral portion of it, is affected with catarrhal inflammation, generally slight, but sufficient to cause adhesion of the eyelids in the morning. There is often some degree of rheumatic sclerotitis, with stinging pain in the eyeball and orbital region. The redness of the conjunctiva or sclerotica is rarely very considerable. The external part of the disease is apt to assume the form of phlyctenular conjunctivitis; then there is intolerance of light; and the cornea becoming involved, presents a small opaque deposit near its centre, which is apt to fall into a state of ulceration. The patient complains of muscæ volitantes, and of such dimness of sight, that even the large letters of a title-page cannot be distinguished. The loss of vision often proceeds to the length of disqualifying the patient from knowing one person from another. The pupil is at first contracted, but after a time becomes somewhat dilated and sluggish, while the cornea and sclerotica are found to yield too readily to the pressure of the finger.

The pulse is small and quick. The patient complains of debility and general ill health, and is somewhat emaciated. Want of appetite, derangement of the bowels, rigors, flushings in the face, headache, vertigo, a dragging feeling in the back, and a deficiency of milk generally attend the disease.

Subjects.—It is rare to find very young women affected with retinitis from undue lactation. The subjects are generally upwards of thirty, who have had several children, and have nursed them long. When they begin to complain of their eyes, they have almost always been nursing for some months, perhaps for twelve or eighteen; but the disease may also occur soon after they have commenced nursing, or not till they have weaned the child. They often state that they have never been robust, and that their eyes were always weak while nursing. They are often of a scrofulous or rheumatic diathesis, and bear evident marks of an impoverished, as well as irregularly distributed state of the blood. Not unfrequently they had suffered, before marriage, from chlorosis, or been weakened by hæmorrhagic or leucorrhœal discharges. Fatiguing themselves much with their infant, supporting it almost entirely by their own milk, allowing it to suck during the night while they themselves are asleep, not taking a sufficiently digestible and nutritive diet, and attempting to keep up their strength by alcoholic drinks, are frequent circumstances in their case. Over-working of the eyes in sewing and the like, want of rest during the night, anxiety of mind, and other causes, often conspire with prolonged or undue lactation, to produce the disease.

Prognosis.—Months, and even years, may elapse, with the best care and treatment, before the symptoms are overcome, and distinct and strong vision restored.

Treatment.—1. The first thing to be done is to give up nursing. The symptoms are often so urgent, that this must be done at once, and without this, other things will be of little or no avail.

2. Notwithstanding the state of general debility, the signs of local congestion, re-action in the organs of vision, and actual inflammation of the retina, cannot be overlooked. General bleeding is out of the question; but the symptoms are often such as vindicate the taking of blood from the temple by leeches, or by cupping.

3. Counter-irritation by small blisters behind the ear, to the temple, or on the forehead, will be proper.

4. Pledgets, wrung out of cold water, laid over the eyes and applied to the forehead and temples, afford great relief.

5. The bowels having been emptied by a laxative, some mild mercurial, such as blue pill or hydrargyrum cum creta, ought to be administered, along with small doses of sulphate of quina, twice or thrice daily, till the gums are touched.

6. The vision clearing under these remedies, the chief indication will be to restore tone to the system, by the cautious use of chalybeates and other tonics. The patient should adopt a mild nutritious diet; but avoid, in general, wine, ale, and spirits. The bowels must be carefully regulated, and perfect exemption from fatigue, hurry, and disturbance, should be enjoined.

7. The eyes must be rested, and employed in no fatiguing occupation. Exercise out of doors, and country air, are important auxiliaries.

8. The external symptoms which so frequently attend the disease, require the employment of the means formerly recommended for ophthalmia tarsi, phlyctenular conjunctivitis, and corneitis. Many of those symptoms are relieved by the use of a collyrium, containing extract of belladonna or sulphate of atropia. As the disease subsides, advantage is obtained from the diluted vinum opii, dropped occasionally on the eye.

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[1] Treatise on the Diseases of the Eye, Vol. i. p. 297; London, 1835.

[2] Ammon's Monatsschrift, Vol. iii. p. 622; Leipzig, 1840.

[3] Practical Treatise on the Diseases peculiar to Women, p. 725; London, 1844.

SECTION XXX. — INFLAMMATION OF THE CRYSTALLINE CAPSULE AND LENS.

Syn. — Crystallino-capsulitis et Lentitis.

Common lenticular cataract, whether soft or hard, appears to be a consequence of impeded or disturbed nutrition, upon the causes of which little light has as yet been thrown; while opacities of the capsule are probably in all instances the result of inflammation, and thus resemble specks of the cornea. Capsular and capsulo-lenticular cataracts generally present themselves to our observation, after the inflammation in which they have originated has subsided; but in other cases we may be fortunate enough to meet with the disease in its acute stage. The appearances which are then presented to observation, have been minutely described by Walther[1], and from numerous opportunities I am enabled to verify, to a certain extent, the accuracy of his description.

He states that inflammation of the crystalline capsule generally occurs about the middle of life, and in subjects of a slightly cachectic disposition. This is certainly true, although in more than one instance of congenital syphilis, I have seen such severe inflammation of the capsule, that the part appeared to the naked eye completely loaded with red vessels; a state not unfrequently observed in the horse[2], but which I have never seen in the adult human subject.

The anterior hemisphere of the crystalline capsule is frequently met with in a state of inflammation, while the posterior seems free from disease. As both are structureless, and after birth non-vascular, the vessels which become evident in disease must be prolongations over their surfaces, from the vessels of neighbouring parts, or new vessels formed in effused lymph.

1. *Inflammation of the anterior hemisphere of the capsule* occurs oftener in light eyes than dark, and is always accompanied by a slight change in the colour of the iris and form of the pupil, the iris becoming a little darker, and the pupil irregular. The motions of the iris are at first lively and extensive, but subsequently become sluggish and limited. The pupil is generally smaller than in the sound state, but sometimes it is irregularly dilated. There usually appears a black or reddish rim of irregular breadth all round its edge, caused by the pigmentum nigrum of the uvea coming into view, or by vascular sproutings from the iris.

Along with these symptoms, a number of red vessels appear in the pupil itself, the largest of which are in some instances visible to the naked eye, but the greater number distinguishable only by the aid of a lens or the ophthalmic microscope. What at first merely appears a red point, assumes under the microscope the appearance of a delicate tissue of vessels. If a single lens be used for this microscopical examination of the eye, it should be one of about ½ inch focus, and the patient should be so placed with respect to the light that the parts within the pupil be well illuminated, and not shaded by the glass, nor by the head of the observer. In order to have the pupil as large as possible, a little solution of atropine may be dropped upon the affected eye an hour previously, and the other eye should be closed during the examination. In this ophthalmia, the sensibility not being much increased, the patient can bear examination of the eye in a strong light and with a dilated pupil, without much uneasiness.

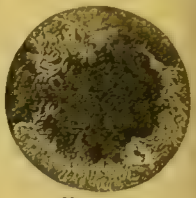
Fig. 58.
From Walther.

The red vessels in inflammation of the anterior hemisphere of the capsule, constitute a vascular wreath, observed at about a quarter of a line's distance from the pupillary edge of the iris; this wreath forms a concentric circle within the pupil, and is observed to consist, not of one or a few vessels circularly disposed, but of a number of vascular loops. (*Fig.* 58. shows a magnified view of the appearances.) To this vascular wreath there run, in a radiated form, numerous vessels from the circumference of the capsule. Other vessels seem to extend from the uvea; but such are not constantly present. It is only in cases where the disease has lasted some considerable time, that they appear. In other cases, according to Walther, vessels seem to be prolonged rather from the capsule into the posterior surface of the iris. Those which run from the iris to the capsule never arise from the edge of the pupil, but at a little distance from it, on the posterior surface of the iris, so that nearly a line's breadth next the pupillary edge is free from these vascular sproutings.

From the vascular wreath already mentioned, vessels spread towards the centre of the anterior capsule, and there again form clusters and loops. The continuation between the vessels seen in different parts of the pupil, seems interrupted at some points; yet there can be little doubt of their being continuous. From their extremely minute size, they are distinguished only where enlarged and clustering together.

2. *Inflammation of the posterior hemisphere of the crystalline capsule* is a much rarer disease than that of the anterior. It is easily recognised by the deep situation of the opacity which it presents, and the stellated arrangement of the vessels. Both hemispheres of the capsule may be inflamed; in which case, behind the red vessels, seen in the anterior capsule, there appears a network of more delicate vessels which seem to be seated in the lens itself. The larger trunks of this network evidently come, says Walther, from its posterior surface, directly forwards, and then divide into branches. (*Fig.* 59. shows a magnified view of the appearances.) The distribution of these vessels bears a resemblance to that of the central artery of the vitreous humour, upon the posterior capsule, in the fœtus.

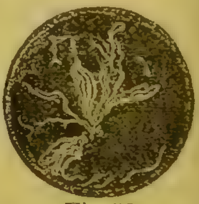
Fig. 59.
From Walther.

3. As *the lens* undoubtedly derives its nourishment from the capsule, it is not to be wondered at that, when the latter is inflamed, enlarged vessels should sometimes be prolonged into the former. The existence of vessels passing into the lens is entirely morbid, and is compared by Walther to what occurs in inflammation of the thorax, when vessels are prolonged from the pleura to the pseudo-membrane formed on its surface. He says, that as vessels from the anterior hemisphere of the capsule shoot forwards into the posterior surface of the iris, so they shoot backwards into the lens itself; and that the

same holds good with respect to the posterior hemisphere of the capsule. He says, that the largest vessels of the inflamed lens are seen to come from behind forwards. It would appear, also, that all inflammations of the lens begin in the capsule; a fact which Walther considers as analogous to the spread of inflammation from the ciliary processes or from the iris to the capsule. It is probable, that congestion of the vessels of the zonula Zinnii attends every case of inflammation, affecting any portion of the crystalline body.

At the apparent terminations of several of the vessels in the capsule, there are distinctly perceived little knots of a whitish-gray semi-transparent substance. This is evidently coagulable lymph, and Walther considers its presence as disclosing the manner in which inflammation of the capsule and lens produces opacity of these parts. The anterior hemisphere of the capsule, where the vessels are often very numerous, sometimes assumes a peculiar velvety or flocculent appearance, and in one or more spots of its extent presents a gray or brownish colour. These brownish spots appear in some instances to be nothing more than effused lymph; but in other cases they probably owe their origin to the iris having been united to the capsule by partial adhesions, which being separated either by more extensive spontaneous motion of the iris, by mechanical violence, or by the sudden influence of belladonna or some similar narcotic, part of the pigment of the iris has remained adherent to the anterior surface of the capsule.

It is a fact strongly confirming the accuracy of Walther's account of inflammation of the crystalline capsule, that in anterior capsular cataract, the specks or streaks generally radiate from the edge of the anterior hemisphere of the capsule towards its centre; while in posterior capsular cataract, they evidently branch out from the centre of the posterior hemisphere[3], following thus the directions of the vessels as represented by Walther.

As to the state of the patient's vision, it is indistinct and confused, where the disease is severe, particularly when the eye is directed towards distant objects. Near objects are seen as if through a fine gauze. This does not seem red, nor are objects tinged of that colour. I have seen the anterior capsule inflamed, along with such dimness of sight as led me to suspect that there was, or had been, retinitis.

This ophthalmia almost always observes a chronic course. It proceeds very slowly, and is attended with little or no pain. When pain does attend the disease, it is seated at the bottom of the orbit, in the forehead, or in the crown of the head. When the disease has continued for some considerable time, the vessels become varicose and remain so permanently. Walther observed the vessels of the lens in a middle-aged man, to remain in a varicose state for a whole year, without undergoing the least alteration. I have seen this disease followed or accompanied by incomplete amaurosis, complicated in one case with tremulous iris. Effusion of fluid between the lens and capsule, and dissolution of the former, are not unfrequent consequences of inflammation of these parts; while in some instances, the disease would appear to go the length of suppuration, for we must consider inflammation as the cause of that variety of cataract which is called *cataracta cum bursa ichorem continente,* the opaque state of the lens and capsule being complicated with the presence of a cyst within the capsule, filled with pus.

The causes of this ophthalmia have not been sufficiently investigated. In one case which came under my care, it affected the right eye of a keen sportsman, and might perhaps have been connected with the over-excitement which the eye must have undergone year after year, at the shooting season. In another case, the patient blamed over-working his sight in gaslight. He had long been affected with an eruption on the head, which disappearing, crystallino-capsulitis occurred, first in one eye, and afterwards in the other.

Inflammation of the lens and capsule approaches nearer to iritis than to any other ophthalmia. It is, however, much less acute in its character, and greatly less under the influence of treatment.

Treatment.—Depletion, counter-irritation, and alteratives, are the remedies which suggest themselves as most likely to do good in the early stage of this disease, and tonics in the latter stages. In the acute stage, I have sometimes succeeded completely in curing inflammation of the anterior hemisphere of the capsule. In a case which I treated lately, on the first day of my being called in, two minute reddish spots were seen projecting from behind the edge of the pupil. Next day, there were five. In the course of a week, the symptoms totally disappeared, under the employment of venesection, leeches, calomel with opium, and belladonna. The mouth was made very sore. In the chronic stage, however, I must confess that this ophthalmia has in my hands proved one of the most obstinate. Cases, generally mistaken and treated for iritis, have been sent to me for consultation, in which a long-continued use of various remedies, including mercury, had been productive of no effect.

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[1] Abhandlungen aus dem Gebiete der practischen Medicin; Vol. i. p. 53; Landshut, 1810.

[2] Leblanc, Traité des Maladies des Yeux observées sur les principaux Animaux Domestiques, p. 409; Paris, 1824.

[3] Medico-Chirurgical Transactions; Vol. iv. Pl. ii. Fig. 9; London, 1813.

SECTION XXXI. — INFLAMMATION OF THE HYALOID MEMBRANE.

Syn.—Vitreo-capsulitis. Hyaloiditis.

The hyaloid is a very delicate, transparent, homogeneous membrane, entirely destitute of vessels in the adult, so that the nutrition of the vitreous humour must be carried on by the vessels of the retina, and of the corpus ciliare. It is probable that the vessels described by Dr. Schroeder van der Kolk, as running backwards from the zonula Zinnii, and forwards from the central artery of the retina, over the surface of the hyaloid, were the product of disease.[1] The morbid states in which the vitreous humour is occasionally found, such as synchesis or dissolution, dropsical increase, atrophy, unnatural viscidity, change of colour, loss of transparency, and ossification, lead us to regard the hyaloid membrane as susceptible of inflammation. A still more convincing proof is, that the vitreous body is sometimes met with, on dissection, infiltrated with exudation corpuscles, or with purulent matter.

Case 283. — I had under my care, at the Glasgow Eye Infirmary, a young man with incomplete amaurosis in each eye. His vision had failed suddenly, about two years before. At that time it was subject to frequent alternations, becoming suddenly diminished, and as suddenly regaining its usual acuteness. He complained of headache, with painful sensations over the body. He was troubled with red spectra before the left eye, but not before the right. The left eye was presbyopic, but with the right eye he perceived near objects more distinctly than distant ones. Deep in the right vitreous humour, a spotted opaque appearance was observed. On dilating the pupil by belladonna, it was evident that there were two sets of opacities behind the lens. One, consisting of a central spot with numerous opaque threads radiating from it, especially downwards and outwards, was situated exactly in the axis of the eye, and a little way behind the lens. The other opaque spot was much deeper in the eye, without any radii, and evidently moved up and down when the patient moved his eye. Each pupil possessed considerable power of motion, and there was no tremulousness of either iris. I considered the appearances in the right eye as indicative of previous inflammation of the vitreous body.

In two subsequent cases, I have seen similar appearances. In one of these, I discovered what I considered the effects of hyaloiditis, on directing the light of a gas jet through the pupil, with a lens. The ophthalmoscopes of Helmholtz[2], Coccius[3], and Follin[4], are likely to assist in the detection of the effects of inflammation, both in the crystalline and in the vitreous body.

Ammon has remarked, that opacity of the posterior wall of the capsule is very frequently the precursor of disease of the vitreous body and of the retina, or is a consequence of it.[5]

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[1] Bowman's Lectures on the Parts concerned in the Operations on the Eye, p. 54; London, 1849: Schroeder van der Kolk, Anatomisch pathologische Opmerkingen over de Ontsteking van eenige inwendige Deelen van het Oog; Amsterdam, 1841.

[2] Beschreibung eines Augen-Spiegels; Berlin, 1851.

[3] Medical Times and Gazette, Sept. 10, 1853, p. 264.

[4] De l'Exploration de la Retine et du Cristallin à l'aide d'un instrument d'optique, Mémoires de la Société de Chirurgie, Tome iii. p. 377; Paris, 1853.

[5] Ammon's Zeitschrift für die Ophthalmologie; Vol. iii. p. 469; Dresden, 1833.

SECTION XXXII. — IDIOPATHIC OPHTHALMITIS.

Syn. — Ophthalmitis phlegmonosa. Phlegmone bulbi, *Beck.* Phlegmon oculaire, *Rognetta.*

Fig. Beer, Taf. I. *fig.* 2.

For ophthalmia we substitute the term *ophthalmitis,* when an inflammatory disease of the eye affects almost all its textures. In some varieties of ophthalmitis, gradually one texture after another becomes affected, till the whole are involved; in others, the disease is so rapid and extensive, that the whole eyeball seems implicated at once. In many instances, not the eyeball alone, but the ocular capsule, the areolar tissue of the orbit, and the conjunctiva, participate in the inflammation. This is the case in *idiopathic, traumatic,* and *phlebitic ophthalmitis,* three diseases, which, though their exciting causes be different, bear a close resemblance in their symptoms.

In all of them the inflamed eye seems greatly swollen, and is protruded from the socket; it suppurates internally, and its textures are thereby so much changed that its function is generally destroyed.

The violence of the pain has caused idiopathic ophthalmitis to be compared to paronychia, and even to be called, though improperly, *panaris of the eye.*

Stages.—The symptoms have been divided into three stages: viz. 1st. The stage of pure inflammation, extending from the beginning of the disease till the retina becomes insensible. 2nd. The stage of suppuration and protrusion of the eye. 3rd. The stage of spontaneous rupture of the eye, of the ocular capsule, or of both.

Symptoms.—1. There is at first only slight external redness of the eye, the conjunctiva is rather œdematous than inflamed, presenting the state which has sometimes been termed *serous* or *white chemosis.* The aqueous humour seems turbid, and is sometimes tinged with blood. The fundus oculi appears reddish. The inflammation produces a change in the colour of the iris; the pupil is somewhat contracted, and the disease may be taken for iritis. The crystalline capsule sometimes becomes opaque, but in other cases preserves its transparency. There is, in general, at the bottom of the eye, and in the orbit, severe pulsative pain, exactly as in an intense whitlow; the pain extends to the forehead and to the temple, and is accompanied by a feeling of burning heat, tension, and fulness, as if the eye could not be contained within the orbit. The patient complains greatly of intolerance of light, and is affected with a sensation of flaming and shining spectra. By and by, this symptom totally subsides, the retina having become insensible from the effects of the inflammation upon its substance, or from the compression arising from the fluids extravasated from the surrounding textures, and especially from the capillaries of the choroid.

2. The total loss of sensibility in the retina may be regarded as a sign of internal suppuration; but the most striking symptom in the second stage, is the projection of the eye. One would suppose the eyeball to be much increased in size, but this is an error; for, after death, the eye which appeared so much swollen, would be found nearly, if not altogether, of its natural dimensions. It is pressed forward by an effusion into the cavity of the ocular capsule; and as in this state it is covered by the chemosed conjunctiva, while the upper eyelid is much extended and the lower everted, the eye presents altogether the aspect of being greatly enlarged. It is besides very hard to the touch, as if it contained a considerably greater quantity of fluid than in health. That it partly does so is true; but the internal effusion is not the only, nor the principal cause of the excessive tension and apparent enlargement of the eyeball. The principal cause of these symptoms, as well as of the projection of the eye, is the effusion into the intra-orbital tissues. The projection of the eye sometimes appears early in the disease; in other cases it occurs later, or even not till the internal parts of the eye and vision are destroyed. It is necessary to observe that there are differences in the progress of the disease, and in the order in which the symptoms follow one another.

In the second stage of the disease, the eyeball becomes absolutely fixed, the state of tension and pain rendering all muscular contraction of the recti difficult or impossible. So completely is the eye fixed, that we cannot even press it from side to side in the orbit.

The conjunctiva continues to swell; and what does not occur except in cases of ophthalmitis, this membrane, especially where it lines the lower eyelid, becomes covered with a layer of coagulable lymph, which may be detached like a false membrane, and which is gradually reproduced. This appearance is observed in idiopathic, traumatic, and phlebitic cases of ophthalmitis, and serves to show the analogy which exists between these three varieties of the disease. If the lens and its capsule have retained their transparency, we may sometimes observe the vitreous humour to present a greenish colour, resulting from infiltration of pus within the hyaloid. The iris is seen to approach towards the cornea, and pus is deposited in the aqueous chambers.

3. The whole eyeball, as well as the ocular capsule, being filled with pus, if the patient survive, the disease passes into the third stage. Its progress is exactly as in whitlow, and after severe suffering on the part of the patient, the matter gains the surface and escapes externally. The rupture of the eye, or of the ocular capsule, is a means of saving the life of the patient, who runs much greater risk if the disease is left to itself, and no spontaneous evacuation of the matter takes place.

It happens sometimes that the cornea becomes infiltrated with pus, or is converted into a slough, and gives way. This is the only disease of the eye, in which I have myself seen a distinct slough separate from the cornea, like a bit of white leather which has been soaked in water. Mention is often made of sloughing of the cornea; but the term is more frequently applied when that structure is destroyed by softening and ulceration, than when it actually separates in a gangrenous state, as we sometimes see in ophthalmitis. The suppuration or sloughing of the cornea is followed by evacuation of the humours, and the eyeball collapses. In other cases, it is the sclerotica and tunica tendinea which give way; and this may take place into the cavity of the ocular capsule, which, opening in its turn through the conjunctiva, allows a large quantity of matter to escape. Sometimes it is the capsule only which bursts, the eyeball remaining entire; but this looks so much like a rupture of the sclerotica, that it is easy to mistake the one for the other. An opening is seen through the conjunctiva, giving issue to purulent matter; and on introducing a probe, it seems to pass completely into the cavity of the eyeball, although it has merely penetrated into that of the ocular capsule. If the eye retains at all its natural size and form, and especially if it retains any sensibility to light, the eyeball has not given way, but only the ocular capsule.

The constitutional symptoms which accompany ophthalmitis, vary considerably, but in general are very intense. The patient is affected with rigors, anxiety, want of sleep, delirium, and sometimes convulsions, especially when the disease is about to terminate fatally. In the beginning, the pulse is full and strong; towards the end of the disease, it is small, feeble, and very quick.

Prognosis.—Ophthalmitis has different terminations. A complete recovery is extremely rare. The disease often terminates in amaurosis. The eye preserves its natural form, or is left somewhat atrophic; the pupil is small and contracted, the capsule of the lens opaque, and the retina insensible.

The disease may terminate in suppuration and rupture of the eye, of the ocular capsule, or of both together. In this case, the eye becomes shrunk.

It is in cases of phlebitic ophthalmitis that the disease is most apt to end fatally. Idiopathic cases sometimes have this termination, which probably would happen oftener, were the eye not to give way spontaneously, or be opened artificially.

The relief which arises from the eye giving way or being opened, resembles exactly what takes place when a whitlow gives way or is freely incised. If the eye is not opened, the patient is apt to fall into a state of coma, from which he does not recover.

Case 284. — Daniel Maclellan, aged 35 years, was admitted into the Glasgow Eye Infirmary, under the care of Dr. Rainy, on the 7th June, 1836.

The bulbs of both eyes are of an intense red, much swollen, and projecting far out of the sockets, but still covered with the upper eyelids. The whole cellular membrane round the eye is œdematous; the lower eyelids swollen and everted. The irides have a greenish hue; the pupils are irregular, and are not affected with light. The right pupil is occupied by an opaque lens; the left presents a hazy whiteness. Has no perception of light nor shade with either eye. Thinks he has a very slight perception with left eye. This disease commenced about a fortnight ago, after an attack of severe pain in side of chest, for which he was bled profusely. Pain has been frequently severe in the eyes, and is still occasionally troublesome above the orbits. Pulse 116, soft. Bowels rather bound. Has been treated with leeching, blisters, scarifications, purgatives, and calomel and opium. Eight leeches to each eye. Eight grains of calomel and eight of aloes.

10th. Swelling of left eye greatly diminished, and vision improved. Swelling of right continues. Ten leeches to right eye.

12th. Right eye still much inflamed. Leeches repeated to right eye. Pill containing 2 grains of calomel and 1 of opium, morning and evening.

13th. The lids were carefully brought together by plaisters, and a compress and bandage applied over the eyes. The swelling of both eyes is much diminished today. Solution of 4 grains of nitrate of silver in 1 ounce of water. Three of the calomel and opium pills daily.

15th. Mouth a little sore. Two pills daily.

16th. Head to be shaved. Blisters behind ears. Twelve drops of vinum colchici at bedtime.

18th. Complains of pain in left eye. Two leeches to left upper eyelid.

22nd. Pain in the left eye was relieved on the 20th. On the morning of the 21st, suddenly became insensible, and expired.

Inspection. The pia mater was rather more vascular than usual. A considerable quantity of serum under the arachnoid, and at the base of the brain.

Right eye. The orbital cellular tissue was infiltrated with serum; it was indurated, and contained a collection of purulent matter, which projected under the conjunctiva, and communicated, by an opening on the under surface of the sclerotica, with the interior of the eye. The sclerotica was greatly thickened, and firmly adherent to the indurated cellular tissue around the entrance of the optic nerve. The choroid adhered firmly by its outer surface. The inner surface of the choroid presented traces of fibrinous effusion, and was completely detached from the retina by a collection of purulent matter, which also extended into the cells of the vitreous body, and communicated with the external abscess through the opening in the sclerotica, already mentioned. The retina and hyaloid membrane adhered firmly, and formed a whitish thickened mass, inclosing the infiltrated cells of the vitreous body, but presenting apertures of communication at various points. The lens was transparent; the iris was adherent to the capsule. Some blood was effused in the anterior chamber, with some traces of lymph.

Left eye. The cellular tissue around this eye was also indurated, infiltrated with serum, and closely adherent to the sclerotica, which was much thickened, especially at the entrance of the optic nerve. The choroid adhered firmly to the inner surface of the sclerotica. Very little fluid was found interposed between the choroid and retina. On turning back the choroid, the retina, hyaloid membrane, and vitreous body were found united into a firm yellowish mass, having much the appearance of coagulable lymph, and with scarcely any traces of purulent matter. The ciliary body was of a dark red colour; the lens and its capsule transparent; a slight effusion of blood in anterior chamber.

Both lungs adhered at several points to the pleura costalis, but they were chiefly cellular adhesions. The left lung was collapsed to one-third of its ordinary size. A fibrinous concretion was found in the left ventricle of the heart, but not firmly adherent to its inner surface.

Maclellan was a strong muscular man. As is noted in the case, he had had pleurisy some weeks before he was seized with the affection of his eyes, and had been bled for it. Whether he had any inflammation of the vein which had been opened, could not be learnt. I place his case, therefore, under the head of idiopathic ophthalmitis, although in many respects it bears a resemblance to cases to be brought forward in the next Section, the phlebitic origin of which cannot admit of doubt.[1] The medical gentleman who first saw him when he began to complain of his eyes, considered the symptoms as indicative of inflammation of the brain. The patient complained of severe pain in his head; he was bled for this, and had calomel and opium. He was also seen by Dr. W. Brown, before being admitted into the Eye Infirmary. Dr. B. saw him 10 or 14 days after the commencement of the ophthalmic disease. Both pupils were then widely dilated, the one more than the other, and immovable. The retinæ were insensible to a lighted candle. The pain had subsided. There was considerable eversion of the lower eyelids. Dr. B. proposed puncturing between the lower eyelid and the eyeball, on the presumption that matter was effused there.

Causes.—The causes of idiopathic ophthalmitis, as in the above case, are often obscure; slight injuries, such as a simple puncture, may produce the disease in some particular states of the constitution. There is reason to believe that ophthalmitis occurs as a consequence of certain eruptive fevers, such as measles, small-pox, scarlatina, and typhus. Whether in these cases the disease arises from pus being taken up by the veins from some of the viscera, can at present be merely proposed as a query.

Treatment.—Ophthalmitis of whatever kind requires the taking away of blood by venesection, cupping, and leeches. The vein at the bend of the arm should be re-opened, as often as the hardness of the pulse and the other symptoms point out the propriety of further depletion.

The chemosed conjunctiva ought to be freely scarified, and the eye fomented with warm water.

Tartrate of antimony has been recommended in large doses; a solution of 6 grains in 6 ounces of water, to be taken in table-spoonfuls every half hour. I have not tried this remedy, as it is inconsistent with the administration of mercury, which I regard as much more efficacious. In the only case of ophthalmitis which I have seen followed by a complete cure, the mouth had become promptly affected by the administration of calomel with opium. The prognosis in this case was very doubtful, so much so that I thought it my duty to state the dangerous situation of my patient to his friends; but as soon as the mercury had acted upon the mouth, the disease began to give way, the eyeball retreated into the orbi, and a perfect recovery took place.

Abstinence must be enjoined, and diluent drinks administered. Cold compresses should, at first, be kept constantly over the eyelids; but when the disease is more advanced, warm fomentations or a warm poultice, should be used. Mustard baths of the feet, and blisters to the neck or behind the ears, are likely to be useful. The eyelids and eyebrows ought to be painted with the extract of belladonna.

In the second stage, the products of inflammation being pent up within the eyeball, so that they cannot be discharged, paracentesis of the cornea, so as to evacuate the aqueous humour, or puncturing of the sclerotica, is to be employed. By puncturing the sclerotica there is, perhaps, very little discharged; but the tension is taken off, and the danger of the disease spreading to the brain is set aside. The form of the eye may be preserved by these means, and even the life of the patient. Should the disease still go on to suppuration, the matter escapes by the aperture made in the cornea or sclerotica, and the eye sinks; or if the wound in either place has healed, it is to be opened again, and a warm poultice continued over the eyelids.

An important part of the treatment consists in opening the ocular capsule. The eye being extremely hard and very protuberant, while an indistinct fluctuation is felt around the organ, as if from a fluid accumulated within the cavity of the ocular capsule, this fluid should be evacuated. For this purpose we proceed somewhat as if we were about to operate for strabismus, dividing the conjunctiva at the internal angle of the eye and towards the lower eyelid, and then passing the lancet close to the globe of the eye, and between it and the lower-internal wall of the orbit, so as to avoid the internal and inferior recti muscles. This being done, there is an immediate gush of serous fluid, mixed with pus; the globe of the eye falls back, and the cornea becomes flaccid, showing that the cause of the excessive hardness and projection of the eye existed behind it, and not in the organ itself. In such cases, the opening of the capsule ought to be had recourse to early, and not delayed till the eye is disorganised or the patient sinking into a state of coma. The operation is simple, and is likely to save both the eye and the life of the patient.

In the third stage, the eye having been emptied either spontaneously or by the knife, the parts remain for a time swollen and painful; but as the suppuration goes on, the swelling of the tissues falls, and the remains of the eyeball shrink. Some astringent fomentation may now be used. If the patient is much weakened from pain, fever, and the debilitating treatment, mild nourishment ought to be given, with small doses of sulphate of quina.

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[1] See fatal case, in which ophthalmitis accompanied inflammation of the heart and brain; Bowman's Lectures on the Parts concerned in the Operations on the Eye, p. 127; London, 1849.

SECTION XXXIII. — PHLEBITIC OPHTHALMITIS.

Syn.—Pyæmic ophthalmitis. Puerperal ophthalmitis. Conjunctivitis muciflua puerperarum, *Walther.*

Ophthalmitis from pyæmia, or purulent infection of the blood, has been observed under a variety of circumstances. It is a consequence of suppurative inflammation in some part of the venous system, and this may be excited in different ways.

1. Inflammation of a distant vein, produced by a wound, or by tying the vein, has been followed by the usual constitutional disturbance attendant on phlebitis, and amongst other secondary effects, by disorganising inflammation of the eye.

2. Suppurative inflammation of the uterine branches of the hypogastric veins, in puerperal women, which, spreading to the iliac and femoral veins, is apt to cause phlegmatia dolens, sometimes produces phlebitic ophthalmitis.

3. Phlebitis produced in erysipelas, or diffuse cellular inflammation, has been known to terminate in ophthalmitis. In one case, I saw ophthalmitis of phlebitic character arise, in consequence of a boil of the opposite cheek.

4. Phlebitis occurring in consequence of febrile diseases, has ended in the same result.

I have little doubt that this termination follows in other cases of phlebitis; but the subject is comparatively a new one, and much remains to be done for its complete elucidation. In all cases of ophthalmitis arising without direct injury, we should suspect this cause. We should examine carefully the different limbs, in order that if there be any swelling, hardness, or pain, in any of the external veins, we may detect it. We should ascertain also the state of the general health, and the history of the patient's previous ailments, so that if phlebitis had preceded the affection of the eye, we may not remain ignorant of so important a circumstance. In fatal cases of ophthalmitis, the venous system should undergo the most careful scrutiny, when the dead body comes to be examined.

1. The two following cases are illustrations of phlebitic ophthalmitis, resulting from wounds of veins: —

Case 285.—Mr. Earle removed a portion of a varicose vein of the leg. This was followed by great constitutional disturbance, inflammation of the vein, deep-seated abscesses in the opposite leg, in both forearms, and in one of the lungs. The day before death, the corneæ were observed to have become opaque and their surface rough, the vessels of the conjunctivæ were injected, and the patient lay with his eyes constantly closed. On dissection, destructive changes were found to have taken place within the globe of the right eye, the crystalline lens was so soft as to yield to the slightest touch, the vitreous humour was of a reddish-yellow colour, and red vessels were distinctly seen traversing its membrane. The retina was of a deep red colour. The third nerve on the left side was evidently flattened, and softer than that on the right. The fifth nerve on the right side had undergone a similar change to a greater extent.[1]

Case 286.—A young man had a ligature placed on the left carotid artery, for an aneurismal disease of one of its branches. Considerable difficulty was experienced in passing the needle round the vessel. Venous hæmorrhage took place during the operation, recurred at night, and occasionally afterwards, for nine or ten days. On the fifth day after the operation, the patient had a severe rigor, succeeded by heat of skin and general febrile symptoms. These increased, the pulse rose to 120, and the constitutional disturbance assumed a violent character. About the 10th day, the vision of the left eye became impaired, and was quickly lost, the pupil was contracted, the iris immovable, and the cornea hazy; effusion took place under the conjunctiva, and the lids were greatly swollen, producing an appearance as if the globes were much protruded. There was, at the same time, a degree of deafness, considerable stupor, and occasionally slight delirium. In the course of a few days, the coats of the eye sloughed at the upper part, and its contents were evacuated.

While these changes were going on in the eye, collections of matter formed, without pain, in different parts of the body, on both shoulders above the insertion of the deltoid muscles, over the sacrum, &c. The constitutional disturbance abated, and the collapsed eye healed over; but the patient never recovered his health. He died five months after, labouring under lumbar abscess, and worn out by hectic. On examination of the body, a portion of the jugular vein, to the extent of 2 inches, was found wanting; the upper and lower ends next the lost part being shrunk, ligamentous, and gradually lost in the cellular substance. On opening the head, pus was found effused in great quantity between the tunica arachnoidea and pia mater, along the base of the brain, and the whole length of the spinal chord. The intermuscular cellular substance of the loins was loaded with pus.[2]

Mr. Arnott, in his valuable paper on the Secondary Effects of Inflammation of the Veins[3], asks, whether, when we consider the circumstances of this case, the venous hæmorrhage, constitutional disturbance, formation of abscesses, and appearances presented on dissection, and compare them with the consequences which have been observed to follow inflammation and suppuration of a vein, and the occurrences in Mr. Earle's case, we can doubt that the affection of the eye arose from the inflammation of the jugular vein, and from the entrance of an inflammatory secretion, probably pus, into the blood.

2. A disease of the eye, similar to that observed in the two cases above quoted, occurring in the puerperal state, has been described by Dr. Hall and Mr. Higginbottom[4], under the title of "Cases of Destructive Inflammation of the Eye, and of Suppurative Inflammation of the Integuments, occurring in the Puerperal State, and apparently from Constitutional Causes." In all of these cases, six in number, the affection of the eye took place in from five to eleven days after delivery. It was preceded and accompanied by serious indisposition, in every instance terminating fatally and under symptoms of extreme exhaustion.

The affection of the eye was characterised by redness of the conjunctiva, intolerance of light, and contracted pupil, rapidly followed by opacity of the cornea and excessive chemosis. In two of the cases, the coats of the eye gave way; and in one of these, where the process was observed, the rupture took place by ulceration of the coats round the cornea. In both of these cases, the collapsed globe had healed over previously to death. In each instance, only one eye was affected, and in five of them it was the left. In the case communicated by Mr. Ward, it does not appear which eye was the seat of the disease.

With the disease of the eye, there also took place an inflammation of the integuments, first observed on the hand, but on careful examination, found in the inferior, as well as the superior extremities, and under which matter quickly formed. In one case only, there was no such inflammation. The authors of the paper conjecture, that the morbid affection of the eye had a constitutional origin. No examination after death seems to have been made in any of the cases.

In his comments on these cases, Mr. Arnott seems to think that, considering the circumstances under which the affection of the eye took place, its characters, and the depositions of pus under the integuments of the body, and comparing these with the known consequences of inflammation of veins, and the frequency of inflammation in the veins of the uterus after parturition, we may be justified in attributing the disease of the eye to inflammation of the uterine veins, and the introduction of pus into the circulation.

I owed to Dr. James Brown the opportunity of seeing the following case of *puerperal ophthalmitis*, which I had no doubt was of the nature of the cases recorded by Dr. Hall and Mr. Higginbottom :—

Case 287.—The patient was a slender scrofulous woman, about 30 years of age, of irritable temperament, sedentary habits, and melancholy disposition. She had been seven times pregnant, and the following numbers indicate the months during which each utero-gestation was continued; viz. 9, 7, 5, 9, 9, 7, 4. She had formerly been subject to discharge from the vagina, probably leucorrhœal, but not immediately before the abortion of the fourth month, which led to her last illness. There was nothing remarkable about the labour. The lochial discharge was scanty, and did not continue above a week, at the end of which time she began to complain of pain in the back and groins, accompanied with slight colds and heats, and little, if at all, relieved by blood-letting and purging, both of which were copiously used. Some 15 or 18 days after delivery, she was seized with very severe rigors, followed by great pain in the head, back, and abdomen; the pain in the abdomen being complained of chiefly on pressure.

The affection of the eye, which, as in the cases already referred to, was the left, came on about 28 or 30 days after the former symptoms had been *apparently* subdued by the usual means, although during all this time, the general state of the patient had been by no means favourable. The affection of the eye was ushered in by new rigors, which were followed by a good deal of fever, rather of a remittent type, and occasional feelings of sinking. The pulse continued from the first, quick, irritated, and by no means strong. The eye was highly inflamed, the conjunctiva much chemosed, the lids swollen, and the lower lid everted. There was severe pain in the eye and head, and excessive intolerance of light, so much so that she was obliged to keep her face covered with a handkerchief, although the window shutters were kept constantly closed. At first tears ran from the eye, and, after a time, purulent matter. The cornea became opaque, but the eye did not burst.

Her mind was all along very desponding. For some days she was slightly incoherent on coming out of sleep, but when roused was sensible to the last. No abscess formed near the surface of any part of the body. She died about eight weeks after the abortion. It is to be regretted that neither the eye nor the body was permitted to be examined.

Case 288.—On the 15th September, 1839, I was requested to visit Mrs. H. along with Dr. Panton. I found her comatose; but she could be roused to put out her tongue, and to state that she had pain in her right temple. The right pupil was dilated, the retina insensible, and the conjunctiva affected with white chemosis. Pulse 150. I learned she had been delivered on the 5th, that the placenta had been adherent, and had to be separated by the hand; that she had complained much of headache, and had had frequent and severe rigors. She died on the 16th.

On inspection, serous effusion, but not profuse, was found in the cavity of the arachnoid. There was no effusion nor infiltration in the orbital tissues. The eyeball was natural, except that the retina was of a reddish colour on its concave surface.

The fundus of the uterus, where the placenta had adhered, was covered with sanious purulent matter; and several of the veins proceeding from it, were filled with pus. Two of them, as large as writing-quills, were completely filled.[5]

Case 289.—Mr. Selkirk, surgeon at Newtonshaw, by Alloa, informed me of the following case. A poor woman in Tillicoultry had a child, and was attended by a midwife, who had some difficulty in removing the placenta, which she brought away in pieces and at different times. Eight days after, Mr. S. being called in, found her labouring under puerperal fever, and insensible. He thought she would have died; but contrary to all expectation, she recovered. He then discovered that the left eye had, while she lay insensible, become enlarged, and that a fleshy excresence projected between the lids. The eyeball seemed much enlarged, and felt hard, and the cornea was projecting and opaque. The poor woman had also phlegmatia dolens of the right leg.

Case 290. — Dr Lee relates, that in a patient of the British Lying-in Hopital, delivered on the 27th January, 1832, obscure febrile symptoms took place a few days after, without any pain in the region of the uterus. On the tenth day after delivery, there was fever, with delirium, tremors of the muscles, and a peculiar dusky sallow complexion; the whole of the left lower extremity was swollen, hot, tense, and shining, and there was exquisite pain on pressure along the course of the iliac vessels on the left side, and down the inner part of the thigh. The conjunctivæ of both eyes suddenly became intensely red and swollen, and the sight was much impaired, if not entirely lost. The right knee-joint became exquisitely painful, and a gangrenous spot appeared over the sacrum. Before death, which took place on the 18th February, the eyes had become enormously swollen, so that the eyelids could not be closed, and vision was completely gone.

Inspection. The coats of the left common, external iliac, and femoral veins, deep and superficial, were all thickened, and their cavities plugged up with firm coagula. The same was the case with the epigastric vein, and circumflexa ilii. The glands in the vicinity of these veins, were enlarged, red, and vascular, and closely adherent to the cellular membrane and outer surface of the vessels. The vena cava, to a short distance above the entrance of the left common iliac vein, had its coats thickened, and a soft coagulum of lymph adhering to its inner surface. The uterine, vaginal, gluteal, and most of the other veins which form the left internal iliac, were gorged with pus, and lined with false membranes of a dark colour. The uterine branches of the right internal iliac vein were also filled with pus and lymph; but the inflammation had not extended beyond the entrance of the trunk of this vessel into the common iliac; and the right common, external iliac, and femoral veins, were all in a healthy condition. In the muscular coat of the cervix uteri, on the left side, was a cavity which contained about half an ounce of purulent fluid. The veins proceeding from this part of the cervix were filled with pus.[6]

The facts above stated or referred to, show that puerperal ophthalmitis may show itself, from the third to the thirtieth day after parturition.

3. In the following case, both eyes appeared to be affected with phlebitic ophthalmitis, in consequence of diffuse cellular inflammation of the forearm:—

Case 291. — Mrs. L. aged 60, previously very healthy, became affected with whitlow at the point of the index finger of the right hand, about the end of November, 1837. She said she had pricked the finger, and that it had afterwards been "poisoned." She described the pain as shooting occasionally from the finger towards the shoulder. The finger was laid open, and a few drops of pus were discharged. In the course of a few days, it was apparent that pus was lodged in the sheath of the flexor tendon, which was opened. This was soon followed by erysipelas over the whole forearm, ending in extensive suppuration. The forearm continued in a bad state for more than five weeks. It was repeatedly punctured, and disorganised cellular membrane was discharged by numerous orifices.

About the middle of January, 1838, she began to complain of rheumatic pains in several of her joints, but without any swelling. She had never been subject to rheumatism, nor to synovitis. A few days after this occurrence, the erysipelas suddenly subsided, and she began to complain of dimness of sight, but without any pain in the eyes. The iris of each eye appeared inflamed, and the pupils were somewhat contracted and very hazy. In three or four days from the commencement of this affection of the eyes, there was a deposition of lymph observable at the lower part of each anterior chamber.

I visited Mrs. L. along with Mr. Maxwell and Mr. Moffat, on the 26th of January. Both eyes were almost completely amaurotic. The capsule of each lens was opaque and of a greenish hue. The pupils were irregular and contracted. These symptoms denoted the existence of inflammation; but their supervention had been unattended with pain, and in this respect the case differed from ordinary instances of iritis. Calomel and opium were given, so as to make the gums sore in a few days; leeches and blisters were applied; and extract of belladonna was used externally.

On the 6th February, nine days from the time when the sight became impaired, the left eye was greatly protruded, and the conjunctiva so much chemosed as to overlap the greater part of the cornea. The swelling was of a pale red colour, and covered with a pretty firm lymphatic exudation, which peeled off in the form of a membrane. The eyeball was very tense. I punctured it with a lancet, through the sclerotica.

In about a week the swelling had fallen, so that the eye retreated into its socket, and presented its natural size, but the rheumatic pains became much aggravated for several weeks. Vinum colchici, external rubefacients, &c., were liberally used, with little apparent benefit.

About the beginning of April, the right eyeball became protruded in a similar way as the left had been two months before, but not to the same extent. It subsided in about the same time, under soothing applications. The left eye afterwards became atrophic. Both remained totally amaurotic.

In the months of June and July, the rheumatic affection abated considerably, and the general health improved; but the patient felt so much weakness in her back that she could not walk without assistance. Several of the lumbar vertebræ appeared a little protruded.

In this case, there were strong grounds for believing that the disease of the eyes was the consequence of some morbid poison, generated during the attack of diffuse cellular inflammation, and conveyed through the body by means of the circulation. A remarkable circumstance was, the length of time which elapsed between the protrusion of the one eye and that of the other.

4. The train of events in the following case was scarlatina, phlegmatia dolens, typhus fever, phlebitic ophthalmitis, and death:—

Case 292.—Stewart Bell, a weaver, aged 23, was admitted into the Glasgow Fever Hospital, on the 14th May, 1836, for scarlatina, and was dismissed cured in the course of a few days. He was re-admitted on the 1st June. At his re-admission, he complained of acute pain in the left thigh and leg, much increased by pressure on the inner part of the thigh. Both the leg and thigh were swollen, but of their natural colour. The left arm was rigid, but not swollen, and pressure or motion produced slight uneasiness. He complained of pain in the joints. Pulse 112, pretty firm. Tongue furred, moist. Bowels loose. It was the impression of Dr. Cowan, whose patient he was, that he was affected with phlegmatia dolens from phlebitis. He had had several rigors on the 24th May, followed by headache, heat of skin, and urgent thirst; and on the 25th, the affection of the limbs commenced. He was ordered ℥ss. of castor oil, with 25 drops of laudanum; gr. jss. of opium at bedtime; and 12 leeches to the thigh.

2nd. Considerably relieved by the leeching. Urine drawn off by the catheter. Thrice a-day 2 grains of calomel with 5 grains of Dover's powder.

5th. Typhoid eruption. Delirium. Œdema of the eyelids to a great degree. Pulse 100. Tongue brown and dry.

7th. Delirium continues. Pulse 100. Tongue much loaded. Bowels slow. Six grains of calomel, with 12 of jalap.

8th. Pulse 120. Powders continued.

9th. Rigidity of both arms. Delirium continues. Pulse 120. Eyes much swollen and protruding. Twelve leeches to head. Powders continued.

10th. Sinking. Pulse 120. Features sharp. During this day, deposition of purulent matter was discovered in both eyes. Died in the evening.

11th. *Inspection.* Dura mater thickened; and in the course of the longitudinal sinus, a small, rough, irregularly shaped, ossified body, about the size of a split pea, was discovered. Brain softer than natural. Lungs engorged, and bronchi reddened. No disease in stomach or intestines. No trace of pus in the veins. The eyeballs, which had previously been much protruded, had sunk nearly to their ordinary place in the orbits.

Left eye. The cellular and adipose tissue surrounding the eyeball, was indurated, swelled, and infiltrated with serum. The cornea transparent. The sclerotica reddish, soft, and thickened, especially around the entrance of the optic nerve. The anterior chamber contained a reddish fluid, with some white flaky matter. The iris was thin and soft. It had contracted no adhesions. The choroid coat adhered more firmly than usual to the sclerotic; its inner surface presented some reddish spots, interspersed with white patches, apparently of lymph, which could not be detached from it, and seemed incorporated with its substance. The ciliary body was not materially changed. The pigment was in some places entirely deficient, and in others the remains of it could be easily separated from the choroid; no trace of it was found on the posterior surface of the iris, and the slight shreds of it which remained on the ciliary processes, were readily removed, so as to leave that structure of a uniform white colour.

The choroid coat was separated from the retina by a considerable quantity of reddish fluid, with whitish puriform flakes, from the entrance of the optic nerve forwards to the zonula Zinnii. It flowed out on penetrating the choroid.

The retina, thus detached from the choroid, was firmly united to the hyaloid membrane, and anteriorly to the zonula Zinnii; so that these textures formed a whitish thickened mass, inclosing a small quantity of a reddish fluid, the remains of the vitreous humour. The membranous laminæ of the vitreous body had entirely disappeared towards its centre. The adhesion and thickening of the retina, zonula Zinnii, and hyaloid, seemed to be from effusion of coagulating lymph. It was most remarkable at the zonula Zinnii, and greater near the entrance of the optic nerve than at the equator of the eye.

The lens and both layers of its capsule were transparent.

Right eye. The appearances were exactly similar, with the following exceptions: — 1. There was a thin lamina of lymph lying in the lower part of the anterior chamber, parallel to the iris, and extending up to the pupillary margin. 2. A zone of the retina and hyaloid membrane in the equator of the eye was so slightly thickened, and so transparent, that the reddish fluid in the centre of the vitreous body was distinctly seen through it, when the light was transmitted through the lens. 3. A slight uniform layer of pigment remained on the posterior smooth zone of the ciliary body, and a very distinct layer on the posterior surface of the iris.

Phlebitis, attendant on typhus fever, is no doubt a rare event; but I understood from Dr. Cowan, that he had witnessed several cases of it. It generally shows itself about the period of convalescence, and not early in the disease, as it did in Bell. For example, one patient, a man of 25 years of age, was pronounced convalescent on the 15th May, had rigors on the 24th, and died on the 29th. Pus was found in the left femoral vein. In two cases, besides that of Bell, Dr. Cowan had seen affections of the eyes, probably the result of phlebitis. In one of these, the corneæ ulcerated on the day of the patient's death; in the other, there were purulent deposition and ulceration of the corneæ, on the 19th day of the fever.

There is reason to believe that cases occur, which are regarded as phlebitis after fever, but are really examples of a fever like typhus, arising from phlebitis. "I remember attending a case in private practice," says Dr. Todd, "where the pus showed itself in the anterior chamber of the eye. This case presented all the symptoms of typhus fever; and for a day or two, I viewed it as such. I was one day much surprised at observing pus in the anterior chamber, which increased in quantity very rapidly, and pus was afterwards found in the elbow and shoulder joints. When we came to examine this patient, we found an ulcer in the heart, at the base of one of the mitral valves."[7]

The reader is, doubtless, acquainted with the fact, that phlebitis is apt to be followed by what have been termed *purulent deposits* in different parts of the body, and that these have generally been ascribed to the circulation of pus in the blood-vessels. The notion, however, that the matter found in the lungs, liver, brain, cellular membrane, and other parts, in cases of phlebitis, is actually that which has been carried through the circulation from the vein originally injured or inflamed, is now abandoned. The matter found in the organs secondarily inflamed is doubtless secreted in these organs themselves; and it appears probable, that it is from inflammation of the veins of these parts, that the secondary affections arise. Far from regarding any mere deposit of pus from the general circulation as the efficient cause of the secondary abscesses which occur in consequence of phlebitis, it is the opinion of recent inquirers[8] that the circulating pus acts only by irritating the coats of the capillary veins in different organs of the body, and exciting them to inflame; and that these inflamed veins produce a circumscribed suppuration around themselves. This is not a conjecture, but an opinion founded on various and accurate observations.

To apply these views to the eye, we cannot believe that the same pus which has passed from the uterine veins, or from the veins of the extremities, in cases of phlebitis, is deposited between the choroid and retina, or in the aqueous chambers of the eye; but that the textures in the neighbourhood of which lymph or pus is found in phlebitic ophthalmitis, have themselves been excited to inflammation; and according to our present knowledge of the subject, it is a probable supposition, that the minutest veins of these textures are the parts in which the circulating pus is first arrested, and in which the irritation and secondary inflammation are first produced. Desmarres[9] refers, however, to several cases of phlebitic ophthalmitis, in which the ophthalmic vein was found on dissection, inflamed and filled with clots.

The effects of the inflammation of a vein may be distinguished into primary and secondary, local and remote. We must not confound these several effects. Take, for example, suppurative inflammation of the veins of the uterus after parturition. The *primary* effects are increased thickness of the coats of the affected veins, false membranes on their internal surface, gradual coagulation of their contents, deposition of pus in their cavities, and occasionally entire destruction of their texture. The *secondary* effects are abscess in the liver, purulent collections in the chest, inflammation and ulceration of the synovial membranes, and ophthalmitis. The effects just now enumerated are also *remote*, while the swelled leg, or phlegmatia dolens, is an example of a *local* effect; being a consequence merely of the obstructed state of the iliac and femoral veins, produced by the original inflammation extending into these vessels. It would be incorrect, then, to speak of *phlegmatia dolens of the eye*, as some have done, meaning thereby the secondary and remote inflammation of that organ, arising from the circulation of purulent matter.

Local symptoms.—Phlebitic ophthalmitis presents the same train of symptoms which I have enumerated in last Section.

The disease begins slowly and insidiously in some cases; suddenly and severely, in others. One eye, or both, may be affected. Sometimes the inflammation seems to commence in the ocular conjunctiva; at other times, it proceeds from the orbital tissues. In many cases, the retina appears to be the focus of the disease.

Pulsatory pain is felt in the eye and orbit, spreading to the forehead and temple, and accompanied with a sensation of burning heat, tension, and fulness, as if the eye could not be contained within the orbit.

The patient complains of photophobia and photopsia. The smallest ray of light occasions a severe feeling of intolerance. This symptom occurs chiefly in the commencement; it subsides as the retina becomes insensible.

There is swelling of the eye, the intra-orbital tissues, and the eyelids. The eye wants only the profuse purulent discharge, to give it all the external characters of a severe attack of purulent ophthalmia. The upper eyelid is sometimes so swollen as to overlap the lower. The eyeball is hard, and incompressible; and in consequence chiefly of inflammatory effusion into the ocular capsule, is pushed almost completely out of the orbit. One unacquainted with the disease, is led to suspect the presence of an abscess or a tumour behind the eye. From the fibrous texture of the shell of the eyeball, we might think it incapable of extension; and, no doubt, it is from its yielding so little, that the severity of the pain arises which attends ophthalmitis. Still it does yield, and the eyeball is distended and increased in volume and contents. Much less so, however, than its state of extreme protrusion, and its pressure against the eyelids, might lead us to suppose.

At first, the conjunctiva is rather œdematous than very red. The aqueous humour is sanguinolent; the iris changed in colour, and coated with lymph; the pupil contracted; the fundus oculi reddish or greenish. There is an involuntary fixedness of the eyeball, the state of pain and swelling rendering its common movements impossible.

Constitutional symptoms. — The constitutional symptoms which attend any secondary phlebitic disease, such as ophthalmitis, are generally of a typhoid description; frequent rigors, prostration of strength, rapid feeble pulse, laboured respiration, emaciation, insomnia, anxiety, low wandering delirium, attacks of vomiting and purging, a leaden and icterous tint of the skin, and a brown parched tongue.

Terminations.—Like the idiopathic variety, phlebitic ophthalmitis has different terminations.

1. A perfect recovery is extremely rare. If the patient survive, the function and the form of the eye are generally destroyed. It terminates in amaurosis, as it did in the case I have related, where it arose from erysipelas. The eyeball may remain almost natural in size, or it may become atrophic. The capsule of the lens is left opaque, and the pupil small and adherent.

2. Phlebitic ophthalmitis terminates in suppuration and rupture of the eye. The cornea infiltrates with pus, and becomes ulcerated; it bursts, and allows the humours to escape, along with portions of pigment, and purulent matter; sometimes it is affected with gangrene, and throws off a distinct slough. In some cases, the sclerotica points

and gives way, so that pus is discharged. In other cases, the ocular capsule bursts; an event which is apt to simulate rupture of the eye.

3. The disease of the eye may subside; but the purulent infection of the blood continuing, pyæmic inflammation of some other organ may follow, such as of the pleura, or the pericardium.[10] From this new affection the patient may, or may not recover.

4. This disease terminates by death. This would certainly happen more frequently, if the eye or the ocular capsule did not give way spontaneously. The relaxation which results from the bursting of the eye, or the ocular capsule, diminishes the violence of the inflammation, and the disease subsides, as does a whitlow treated by a deep incision. On the other hand, the inflammatory action, if unsubdued, is propagated to the brain or its membranes, and ends in fatal coma; or the patient sinks from typhoid exhaustion.

Prognosis.—The danger of the disease spreading to the brain, or of the patient sinking, either without any new symptoms, or after an affection of the synovial membranes or other organs, must render our prognosis always extremely guarded. According to the intensity of the symptoms, and their seeming tendency to such or such a termination, the friends must be warned of the dangerous, or very dangerous, state in which the patient is.

Treatment.—The tendency to rapid sinking forbids active depletion; but in other respects, the same general line of treatment must be followed as in the idiopathic variety. Colchicum has been recommended; but I believe calomel with opium, to be the best internal remedy. Leeches, and fomentations to the eye, are of much service.

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[1] Medical Gazette; Vol. ii. p. 284; London, 1828.

[2] See case after ligature of carotid in Brasdor's method, by Colson, Mémoires de l'Académie Royale de Médecine, Tome ix. p. 80, Paris, 1841. The patient recovered with the loss of the eye, which burst spontaneously, and became atrophic.

[3] Medico-chirurgical Transactions; Vol. xv. p. 120; London, 1829.

[4] Ibid. Vol. xiii. p. 189; London, 1825.

[5] The details of this case are given in Dr. Panton's inaugural Essay on Uterine Phlebitis; Glasgow, 1840.

[6] Medico-chirurgical Transactions; Vol. xxviii. p. 347; London, 1845. See other cases by Lee, Ibid. p. 349; Ibid. Vol. xv. p. 370: by M'Whinnie, Ibid. Vol. xxxi. p. 65: by Graves, Medical and Surgical Journal, Vol. iii. p. 360; London, 1833: by Moser, Ammon's Monatsschrift, Vol. iii. p. 216; Leipzig, 1840: by Weir, Monthly Journal of Medical Science, Sept. 1847, p. 209. In the cases related by M'Whinnie and Weir, the patient recovered, with the affected eye atrophic. The other cases were fatal.

[7] Medical Times and Gazette, February 21, 1852, p. 182.

[8] Cruveilhier, Anatomie Pathologique, Tome i.; Livraison ii.: Dictionnaire de Médecine et de Chirurgie Pratiques, art. *Phlebite:* Douglas, Inaugural Essay on Phlebitis; Glasgow, 1835.

[9] Traité des Maladies des Yeux, p. 244; Paris, 1847.

[10] See case of phlebitic ophthalmitis, consequent on amputation, and followed by pleurisy, with dissection, by Bowman: Lectures on the parts concerned in the Operations on the Eye, p. 123; London, 1849: Case after scarlatina, followed by an affection like rheumatism and by pericarditis, by Porter, American Journal of the Medical Sciences, January, 1845, p. 85.

SECTION XXXIV.—POSTFEBRILE OPHTHALMITIS.

Syn. — Ophthalmia post febrem.

The cases whence I have drawn the following account of postfebrile ophthalmitis, were the result of an epidemic fever, which prevailed in Glasgow during the greater part of 1843 and 1844, supplanting the exanthematic typhus to which this town had immediately before been subject.

The new fever was a remittent, often accompanied with jaundice, its first paroxysm coming to a crisis within seven days, a relapse happening almost invariably, the patient rarely suffering more than two paroxysms, and the mortality probably not exceeding 2½ per cent. I am unable to say, whether the same species of fever had ever before been known in Glasgow. At the same time that this town suffered from it, it prevailed in Edinburgh, Dundee, and several other places in Scotland. That it had at different times prevailed in Ireland is shown from the fact, that the course observed by some of the Irish epidemics corresponds closely with that of the Glasgow fever; while the complete identity of this fever with that which prevailed in Dublin in 1826, is proved, not only by the correspondence in their general course, but also by the exact similarity of the affection of the eyes, observed as a sequela in both instances.

That the organs of vision are apt to suffer from various kinds of fever, has long been observed. Even Thucydides mentions[1] in his account of the plague at Athens, which has been supposed to have been typhus, that some lost their eyes in consequence. Typhus is sometimes followed by muscæ volitantes, or even by amaurosis, and in some rare instances by general ophthalmitis. I have known the disease called hay-fever, to be followed by intermittent ophthalmia of iritic character, ending in amaurosis. Dr. Lawrie informs me, that remittent fever in India is sometimes followed by corneitis and sloughing of the corneæ. Certainly no febrile disease with which we were previously acquainted in this country, was followed by such an inflammatory affection of the eye as that which I am about to describe.

Symptoms of the remittent fever.—The disease commenced with the usual symptoms of fever, rigors, headache, and sickness. A striking feature was the frequent and excessive vomiting, or straining to vomit, attended by pains throughout the body, resembling those of rheumatism. There were often no premonitory symptoms, the attack being very sudden, and marked by excessive weakness. One little boy whom I saw, was seized in the street, and fell down, so that he required to be carried home. In some of the cases, the disease resembled very much sea-sickness in its accession, both in respect to the prostration of strength by which the vomiting was accompanied, and the total indifference of the patients whether they lived or died.

The pulse was much accelerated. It often rose, the night before the crisis, to 140; then fell at once to 84, or less. The tongue was not much loaded; after a time, it became brown and dry. Especially in the night, the patients were delirious; often affected with subsultus tendinum; could not sleep, tossed continually, and insisted on getting up.

Epistaxis in some, and jaundice in others, were of frequent occurrence. When the disease attacked women about the menstrual period, the discharge was very copious; and almost all the women in a state of pregnancy who were seized, aborted, if in the early months, or had premature labour, if farther advanced. If pregnant women affected with the fever, went the full time, sometimes the child was dead, or if born alive, the mother had no milk, and had a troublesome and lingering recovery, while the child generally died from want of support, or perhaps from being affected with the fever.

At the height of the disease, the symptoms were the same as at the beginning, only of greater violence. Convulsions were not uncommon, immediately before the crisis. Sometimes they proved fatal.

There was no certain period when the first crisis happened. The patient was generally several days ill, perhaps five or six, when a decided change took place by profuse perspiration during the night, generally preceded by a severe rigor. Next morning the patient expressed himself as if in a new world; the tongue had become moist, the thirst was greatly abated, and he was free from sickness and headache. In old people, there was little or no perspiration at the crisis; but the change was at once observed by the more agreeable expression of the countenance, and the manner of speaking.

Some patients had a very short remission; others had one of considerable length. In some, it lasted only for three or four days; in others, for two or three weeks. Very few escaped a return of the fever. Whether they got up, and perhaps went out of doors, or confined themselves closely to bed, nineteen out of twenty relapsed. Where the first attack was mild, the second was generally more severe, and *vice versâ.* If any improper freedom had been used in diet during the remission, the second paroxysm was generally more severe than the first.

The relapse occurred with the very same symptoms as the original attack. The patient, whom the day before we had left to all appearance convalescent, we now found again in the height of the fever, excessively weak, his countenance often shrunk to such an extent as to remind one of the collapsed stage of malignant cholera, and his skin covered with a clammy disagreeable perspiration.

The general duration of the second attack was much about that of the first, the second crisis taking place sometimes in two or three days, but more commonly not before four or five. If there were any difference in the symptoms of the first and second attacks, it was in the muscular and articular pains being of greater severity in the second. There was also considerable pain in micturition. Dysentery sometimes attended the second attack, traceable not unfrequently to the use of spirits during the remission.

A second or third relapse was rare; but some patients having had the disease, with its paroxysmal character well marked, and who therefore thought themselves secure, were seized with it again, after an interval, in some instances, of several months, and went through all its stages a second time; a circumstance which, along with others already mentioned, served to draw a broad line of distinction between this fever and exanthematic typhus.

Various sequelæ were observed to follow the fever; such as pains in the joints, want of power in the extremities, œdema of the feet, enlargement of the glands in the neck, boils in different parts of the body, and long-continued debility. But the most remarkable was the amaurotic and inflammatory affection of the eye, which is the subject of the present Section.

The fever appeared to be highly contagious. Where many individuals, ill-fed and ill-clothed, lived together in small, dirty, and ill-ventilated apartments, it generally went through the whole of them, young and old, in rapid succession.

The smallness of the mortality, compared with the severity of the symptoms and the debility left by the disease, was a matter of wonder.[2]

Statistics of postfebrile ophthalmitis.— The following are a few statistical facts, which may be worthy of notice: —

From the 8th August till the 31st October, 1843, when I finished my quarterly period of attendance at the Glasgow Eye Infirmary, 36 cases of postfebrile ophthalmitis were taken on the list. During 1843 and 1844, out of 1877 patients admitted, 261 were affected with this disease. The general subjects of it were from 17 to 20 years of age; but it spared neither young children, adults, nor old people. The general character of the disease was partly amaurotic, partly inflammatory. In by far the greater number of cases, the eyes attacked had been previously healthy, but in some instances they had suffered from other diseases, and in one case they were already in a great measure disorganised.

Out of the 36 cases which I treated in August, September, and October, 1843, 27 occurred in females, and only 9 in males. The following were the ages of the 36 patients: — Below ten, 2; from ten to twenty, 17; from twenty to thirty, 9; from thirty to forty, 2; from forty to fifty, 3; from fifty to sixty, 3. In eighteen of the cases, the right eye only was affected: in ten, the left only; and in eight, both eyes, either together or consecutively. The attack of ophthalmitis occurred at various periods, from three to sixteen weeks from the commencement of the fever. In several cases, it came on about two weeks after convalescence from the relapse, but generally somewhat later.

The very same disease of the eye occurred after the Dublin epidemic of 1826, and was described by Mr. Hewson[3], Dr. Reid[4], Dr. Jacob[5], and Mr. Wallace.[6] The last-mentioned author has remarked the greater liability of the right eye to be affected than the left. " Of forty cases," says he, " which I have noted, there were only four who had the disease in the left eye, and only two had it in both." Out of ten cases in which it happened to me to observe it in the left eye, seven were females. The attack is generally traced to a draught of cold air during the night; it is probably the eye which is the more exposed, which becomes affected, while that belonging to the side on which the patient rests, escapes.

Dr. Jacob has remarked, that the disease occurs much more frequently in young than in old persons. Of thirty cases in which he noted the ages, three only were above 25. He also met with it more frequently in females than males. In the majority of the cases seen by him, the inflammation made its appearance within six weeks or two months after recovery from the fever; in some instances, however, it appeared before the patients left the hospital; and in others, not for four, five, or even eight months.

My colleague, Dr. A. Anderson, in an excellent communication[7] on postfebrile ophthalmitis, says: —" There was not always an interval of time between the end of fever and the onset of the ophthalmia, and that which usually occurred was of very various length. Thus, of 135 cases, the symptoms (amaurotic or inflammatory) of the affection of the eyes began during the fever or relapse in 10; at once upon the convalescence in 34; within a fortnight of the convalescence in 29; within the following month in 31; within the next five or six months in 31."

Symptoms.—The character of postfebrile ophthalmitis appears to be, in the first instance, that of congestion, followed by inflammation of the internal parts of the eye, and especially of the retina, producing great imperfection of sight. This is succeeded by evident inflammation of the iris and sclerotica; the disease extends to the capsule of the lens, and sometimes to the lining membrane of the cornea; there can be little doubt but that the choroid is also implicated, although not to a great degree; while the conjunctiva remains in general but slightly affected.

The part which the sclerotica takes in the disease, is plain enough from the intense injection of the blood-vessels which lie on its surface, and are seen running in radii towards the cornea. The change of colour in the iris, the contracted state of the pupil, and the tags of adhesion between the edge of the pupil and the capsule of the lens, show how much the iris is affected. The internal membrane of the cornea, and the anterior crystalline capsule, especially the latter, are extremely muddy, showing their participation in the inflammation. The whole walls of the aqueous cell seem, in some cases, as if coated with a thin layer of lymph, of a yellowish-green colour. The great deficiency of sight is not explicable from the mere muddiness of these parts, and is, besides, the earliest symptom of the disease, showing an affection of the retina. In some cases, an effusion of a whitish colour is seen, apparently on the surface of the retina. In other cases, whitish and reddish flocculi are seen waving in the vitreous humour. At an early period, the pupil is sometimes dilated, and becomes contracted only after the inflammation has extended to the iris. If not promptly combated by the appropriate remedies, the cornea and sclerotica become abnormally flexible under the pressure of the finger, showing a deficiency in the quantity of vitreous fluid. In one case, I found the cornea very flexible in the amaurotic stage, before there was any external appearance of inflammation. The flexibility of the coats of the eye gradually disappears, and the organ becomes once more natural in consistence, but not till long after the other symptoms have yielded.

At the commencement, it seems probable that the retina only is inflamed. The irritation and injection speedily spread to the short and long ciliaris, to the vessels of the ciliary process, and to the sclerotic network; and in proportion as these vessels become inflamed, the iris, the lining membrane of the cornea, the crystalline capsule, and the hyaloid, show signs of being implicated in the disease.

The lacrymation, in the second period, is very considerable, and seems to be connected, not so much with the state of the conjunctiva, as with that of the interior of the eye. The severe pain in and round the eye, aggravated during the night, is exactly similar to what attends rheumatic and syphilitic ophthalmia, and while no doubt partly the effect of pressure exercised by the inflamed tissues upon the ciliary nerves within the eye, may be partly, perhaps, a direct neuralgic affection, such as, even when there is no evident inflammation present, we often meet with in the branches of the fifth nerve emerging from the orbit. It is, in general, only after the iris and sclerotica have taken part in the disease, that the patient complains of ocular and circumorbital pain. So long as the disease is confined to the retina, there is little or no pain. Hence the patient is less alarmed than he should be by the mere dimness of sight, which, indeed, from only one eye being generally affected, may scarcely attract his attention. Photopsia is not a symptom of which the patient makes much complaint. Muscæ volitantes form a constant symptom, especially after the inflammation has yielded and the eye is becoming convalescent. They then seem so numerous, that one patient compared his state of myodesopia as if a sooty bag had been shaken before him.

Although, in by far the greater number of cases, all the textures of the eye suffer in this disease, on which account it is designated as an ophthalmitis, it sometimes happens that the inflammation is confined to one or two textures only. Thus, in one case, the anterior crystalline capsule, and the lining membrane of the cornea only, were affected with inflammation.

The pulse varies from 84 to 120. Frequent rigors occur. The tongue is generally clean and moist. The pain entirely prevents sleep.

The affection of the eye may be complicated with one or more of the other sequelæ of the fever, already mentioned.

Diagnosis.—The present disease is much more extensive, in respect to the number of textures affected, and much more intensive, in so far as the morbid action which is at work is concerned, than rheumatic ophthalmia or rheumatic iritis, to which, however, in many particulars it bears a resemblance. Yet, along with postfebrile ophthalmitis, we have neither the bounding pulse, the hot skin, nor the white and loaded tongue, which attend inflammation of the sclerotica and iris from mere exposure to cold. Neither is the blood drawn from a vein so buffy. The pain at last is not less distressing. Vision is much sooner and much more seriously involved.

Mr. Wallace considers this affection of the eye as bearing so very striking a resemblance to syphilitic ophthalmia, that the one cannot be distinguished from the other, without particular attention to the history of the case. The absence of the tawny-reddish border which surrounds the pupillary margin of the iris, and there being no tubercles on the iris in postfebrile ophthalmitis, will serve to distinguish the two diseases.

The acuteness of the present disease will discriminate it from scrofulous iritis, to which, particularly in the appearance of the lens, it bears considerable resemblance, as well as in the degree to which the retina is affected. In scrofulous iritis, however, the affection of the retina is among the latest symptoms; in postfebrile ophthalmitis it is the earliest.

In some instances, the present disease bears a considerable resemblance to catarrho-rheumatic ophthalmia. Onyx, so frequent in the latter disease, I have not witnessed in the former. In one case, I observed a considerable portion of the epithelium of the cornea exfoliated; but never the ulcer which affects the proper substance of the cornea, and which is so characteristic of catarrho-rheumatic ophthalmia.

The disease to which postfebrile ophthalmitis bears the nearest resemblance, is sympathetic ophthalmitis; which, as I shall explain in a following Section, results so frequently in the one eye, from incised and lacerated wounds of the edge of the cornea and sclerotica, and consequently of the orbiculus ciliaris, of the opposite eye. The cause of the similarity is that, both in sympathetic and in postfebrile ophthalmitis, the inflammation commences in the retina, advances to the iris, embraces all the internal textures of the eyeball, and ends, if neglected, in opacity of the crystalline, closure of the pupil, and softening of the globe. The slightest inquiry into the history of the case will, in either instance, elucidate the origin of the affection.

Stages. — Mr. Wallace has described this disease as presenting two stages; the first amaurotic, and the second inflammatory. My own experience entirely confirms the accuracy of Mr. Wallace's description. "During the first stage," says he, "there exist amaurotic symptoms alone; and in the second stage, to the amaurotic symptoms are added the symptoms of inflammation. The length of time that the amaurotic symptoms exist before the occurrence of external redness, or of the visible signs of inflammation, is extremely uncertain, as also the period after fever at which the amaurotic symptoms commence. On many occasions the amaurotic symptoms, particularly a slight dimness of vision, with muscæ volitantes, have commenced at, or even before the time of convalescence from fever, and yet the inflammatory stage has not supervened for weeks or even months; while on other occasions the dimness of vision has not commenced for several days, weeks, or even months, after the febrile attack, and has then been immediately followed by the symptoms of inflammation. It is to be particularly observed that I have never seen a case in which, upon strict inquiry, amaurotic symptoms, more or less strongly marked, have not preceded the inflammatory symptoms. This is, in fact, one of the most remarkable characters of the disease. It is also to be noticed, that a similar distinction of symptoms is observable during amendment; for it uniformly happens that the inflammatory symptoms subside a longer or shorter time before the amaurotic symptoms disappear, and often before they are diminished in severity."[8]

Not a few of the cases which came under my observation wore, not merely at the commencement, but all along, much more the aspect of amaurosis than of ophthalmitis. In one case which I saw, the patient was suddenly struck blind of the affected eye. In another case already referred to, along with the amaurotic symptoms, the cornea had become flexible; and no longer apprehensive of inflammation supervening, I had commenced the use of quina and blisters, when suddenly pain and redness set in. I met with several cases in which for days the principal symptoms were pain in and round the eye, and dimness of sight. In other cases there was redness of the eye from the very commencement.

Predisposing and exciting causes.—That an opportunity is afforded for the disease of the eye by the fever is plain; there may even be grounds for believing that the fever has left the circulating fluids in an altered state, favourable for the production of the local complaint. However this may be, the affection of the eye is generally traceable to some exciting cause, and especially to cold. Sleeping in an apartment with broken windows, working in a cold damp shop, and washing the head with cold water, were mentioned by some of my patients as exciting causes. Using the eyes too early in sewing, during the convalescence from the fever, is another.

Prognosis.—The recovery is tedious. In the majority of cases, two months of uninterrupted and careful treatment were necessary to effect a cure. That the disease without any treatment will wear itself out, is true; but the eyes will be left useless, from the contracted and adherent state of the pupil, and the amaurotic condition of the retina. If trifled with, the cure will be imperfect; synechia posterior, muscæ volitantes, and other irremediable sequelæ, remaining. Taken early and treated vigorously, a complete cure may be prognosticated. Recovery is much more speedy and complete in young subjects; in adults, it is more tedious.

Treatment.—1. *Depletion.* The wan appearance of many of the patients, the smallness of their pulse, and the state of general debility in which they are, might tend to deter from using the lancet. I am satisfied, however, that we can rarely, with safety, dispense with this remedy. The blood drawn from a vein is generally buffy; but the buffy coat peculiar, not white and coriaceous like that of pneumonic blood, not yellow and dark like that in syphilis or hepatitis, but of a whitish semi-transparent appearance, like half-boiled white of egg. Often it is difficult, from syncope coming on, to obtain more than a few ounces from the arm. When this is the case, recourse must be had to leeches to the temple and round the eye.

If depletion is omitted, the recovery is very slow and uncertain; adhesions form, and cannot be got rid of, and vision continues imperfect. We must not be regulated by the pain alone, in taking away blood. Nothing relieves indeed the pain so strikingly and effectually as venesection; but the state of the eye, independently of the pain, demands bleeding. We should not even wait for the openly inflammatory stage of the disease; but relieve the congestion, on which the amaurotic symptoms depend, by the employment of depletion.

Some cases, especially in children, I have trusted to leeching; but in adults, venesection is almost always necessary. I have not used arteriotomy, nor cupping; but have no doubt of their efficacy.

2. *Purgatives.* The tongue being generally clean and the bowels regular, there seem to be little demand for purgatives. At the same time, I have found them of considerable use in the course of the treatment. Sulphate of magnesia, castor oil, and compound powder of jalap, are those I have most employed.

3. *Mercury.* I am decidedly of opinion that the safest and most effectual plan of cure embraces the use of calomel with opium, exactly as in the treatment of rheumatic or syphilitic iritis. This view of the matter is confirmed by the testimony of Mr. Hewson, who seems to have trusted to opening the temporal artery, and giving three grains of calomel with half a grain of opium, each night. Dr. Jacob, also,

found the use of mercury so certain and decisive in this affection of the eye, that he trusted to it almost exclusively. He gave two grains of calomel and a quarter of a grain of opium, thrice a-day. The mouth should be made sore, but not too suddenly, lest we be obliged to omit the medicine prematurely.

4. *Belladonna.* Dilatation of the pupil is an essential part of the treatment. This is to be effected by liberally painting the eyelids and eyebrow with the moistened extract of belladonna, morning and evening; directing the patient to renew its activity from time to time, by remoistening it with his finger dipped in water.

5. *Counter-irritation.* Considerable benefit is derived from blisters to the temples and behind the ears, after due employment of depletion. They aid in removing the pain, lessening the inflammation, and recalling the power of vision.

6. *Cinchona.* Mr. Wallace has keenly advocated the supremacy of cinchona, as a cure for this affection of the eye. He thinks it has a specific influence over the disease; recommends it both when the patient is weak and seems to require tonics, and when he is in full health; maintains the incurability of the disease by mercury; and is decidedly of opinion that there must exist some source of error in Mr. Hewson's account of the cases cured by this medicine.

I have not employed cinchona bark in powder; but the trials I made of sulphate of quina, did not lead me to form a very high opinion of its efficacy in this disease. Some of the milder cases yielded, indeed, to the combination of calomel and quina. One case was much benefited by quina; in another, it acted very slowly and imperfectly. On the whole, I feel indisposed to trust to this remedy; and on this point I find my views corroborated by the experience of Dr. Jacob. "In two cases which I met with," says he, "after the inflammation had subsided, and in which vision was as much impaired as if no remedies had been adopted, bark, in powder, had been administered for ten days. I gave trial to the sulphate of quinine myself in four well-marked cases for eight days; but finding no relief had recourse to mercury, which effected a cure in the usual time."

I shall not extend this Section by commenting on the advantages to be derived from regulating the diet of the patient, and protecting him from cold; on the utility of warm fomentations, and anodyne frictions; nor on the probable effects of several internal remedies, which I have not tried; such as, tartar emetic, colchicum, and turpentine.[9]

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[1] De Bello Peloponnesiaco, Lib. ii.

[2] On the remittent fever, consult Cormack's Natural History, Pathology and Treatment of the Epidemic Fever, &c.; Edinburgh, 1843: Wardell on the Scotch Fever of 1843, in London Medical Gazette for 1847. On the Irish fevers of the same type, consult Rutty's History of the Diseases of Dublin, during forty years; London, 1770: Reid and O'Brien, Transactions of the Association of Fellows and Licentiates of the King and Queen's College of Physicians in Ireland; Vol. v. pp. 266, 512; Dublin, 1828.

[3] Observations on the History and Treatment of the Ophthalmia accompanying the Secondary Forms of Lues Venerea, pp. 34, 109; London, 1814.

[4] Transactions of the Association, &c.; Vol. v. p. 294; Dublin, 1828.

[5] Transactions of the Association, &c ; Vol. v. p. 268.

[6] Medico-chirurgical Transactions ; Vol. xiv. p. 286 ; London, 1828.

[7] London and Edinburgh Monthly Medical Journal, October, 1845.

[8] Op. cit. p. 294.

[9] For a detailed account of cases of post-febrile ophthalmitis, see London Medical Gazette, Nov. 24. 1843: and Dr. A. Anderson's communication above referred to.

SECTION XXXV. — COMPOUND OPHTHALMIÆ.

Strictly examined, few instances of the ophthalmiæ will be found absolutely simple. Many are strikingly compound, even from the first; for example, the catarrho-rheumatic, already described. In other cases, one variety is grafted on another; for instance, scrofulo-catarrhal ophthalmia, beginning as a slight puro-mucous conjunctivitis, but soon manifesting, in addition, the signs of phlyctenular ophthalmia. We often meet with aphthæ of the conjunctiva, combined from the commencement with blenorrhœal inflammation of that membrane. Phlyctenular conjunctivitis with scrofulous iritis, scrofulous corneitis with iritis, arthritic with syphilitic iritis, traumatic with syphilitic or scrofulous ophthalmia, and many other compound ophthalmiæ, might be enumerated.

The treatment of such diseases will, of course, consist in the combined use of the means which are ascertained to be effectual in removing the simple forms of the ophthalmiæ. The treatment necessary for scrofulous ophthalmia will be combined, therefore, with that for catarrhal conjunctivitis, in the scrofulo-catarrhal cases; while in the catarrho-rheumatic ophthalmia, the remedies for rheumatic inflammation of the sclerotica will be required along with those for blenorrhœal inflammation of the conjunctiva; and so on, in any other compound ophthalmiæ which may occur.

SECTION XXXVI. — TRAUMATIC OPHTHALMIÆ.

Fig. Wardrop, Pl. VI. *fig.* 1. Dalrymple, Pl. XII. *fig.* 1.

It has been explained in the preceding Sections of this Chapter, how each texture of the eye suffers, in its own way, from inflammation, excited without any evident mechanical or chemical injury; the conjunctiva suffering puro-mucous and eruptive diseases; the sclerotica, rheumatic disease and ramollissement; the iris undergoing adhesive inflammation; the cornea losing its transparency, and becoming the seat of purulent infiltration and of ulceration; the choroid becoming the source of fibrinous and serous effusions, and protruding through the atrophied sclerotica; the retina losing entirely its sensibility to light; every texture, in fact, suffering differently.

The inflammation which is excited by the evident mechanical or chemical injuries, the immediate effects of which have been considered in the first and second Sections of Chapter IV. and in Chapter XII., may attack one or several of these textures. We may have traumatic conjunctivitis, traumatic corneitis, traumatic iritis, &c., and it is remarkable, that traumatic inflammation in any of the textures of the eye imitates, so to speak, the ophthalmiæ which we have already considered. We meet with puro-mucous conjunctivitis, excited by injury, and we often see pustular or phlyctenular conjunctivitis, brought on by the same cause. Traumatic iritis (the iritis, for example, which is so apt to occur after the operations for cataract), very closely resembles rheumatic iritis; but in certain subjects is nothing else than the disease already described as arthritic iritis. The cornea, by traumatic inflammation, is rendered opaque, or becomes affected with onyx, or with ulceration; the lens also loses its transparency from the same cause, and the retina its sensibility.

This observation, duly understood, will throw a great degree of light on the treatment of the traumatic ophthalmiæ. Puriform inflammation of the conjunctiva, arising from injury, is to be treated, in fact, exactly as we treat catarrhal ophthalmia. In traumatic iritis, the three great objects, to abate the inflammatory action by depletion, to oppose the contraction of the pupil by belladonna, and to promote absorption by mercury, are to be followed out, exactly as in rheumatic or syphilitic iritis.

For these reasons, I thought it proper to say nothing of the traumatic ophthalmiæ, till we had finished the consideration of the varieties of inflammatory disease, which are excited in the different textures of the eye by atmospheric and constitutional causes. Without a knowledge of these varieties of the ophthalmiæ, we should be but little able to understand the inflammatory effects of evident mechanical and chemical injuries upon the several structures combined in the eye; but with such a knowledge, both the symptoms and the treatment of the traumatic ophthalmiæ become perfectly simple. These symptoms vary, no doubt, *ad infinitum*, in regard to severity; while in one case, a single texture, and in other cases, several textures of the eye will suffer; still, the invariable and peculiar physical and vital properties of each texture serve to produce, under whatever circumstances or by whatever causes inflammation may be excited, the same essential phenomena.

The severity and the result of the traumatic inflammations of the eye depend on the textures implicated, the extent of parts injured, the nature of the means by which the injury was inflicted, mechanical, for example, or chemical, sharp or ragged, the force with which it was applied, the constitution of the patient and his conduct after receipt of the injury, and the treatment pursued.

In all cases of injury of the eye, there is a certain breach of continuity to be repaired; in simple incised wounds, nature often accomplishes this without inflammation; but in contused and lacerated wounds, in deeply penetrating punctures, and sometimes even after apparently trivial and superficial injuries, we have to contend with consequent irritation, epiphora, photophobia, inflammation, and the consequences of inflammation, as suppuration, ulceration, &c. The general treatment consists in rest of the eyes and of the body, exclusion of light, low diet, purging, bleeding, calomel and opium; in slight cases, refrigerants to the eye; in more severe cases, warm fomentations and dilatation of the pupil.

Even a slight injury may be followed by such a complete inflammation as to warrant the appellation of *traumatic ophthalmitis*, in which, as in some of the varieties of ophthalmitis already described, the eye swells and protrudes from the orbit, the lids are everted, and the conjunctiva is covered with a lymphatic exudation, the fundus oculi reddens, the hyaloid becoming infiltrated with lymph or pus assumes a green colour, the cornea suppurates or sloughs, the eye bursts, and ultimately shrinks to a small stump. I have known a small cut of the cornea to produce ophthalmitis, ending in atrophy of the eyeball.

In every case of traumatic inflammation, it is necessary to pay great attention to the state of the digestive organs. It is in vain to suppose that bleeding and salivation will remove an inflammation resulting from injury, and prevent suppuration, if the stomach is allowed to remain in a disordered state, or the bowels left loaded with undigested food or morbid secretions. Under such circumstances, purgatives and alteratives are to be administered, till a healthy condition of the digestive system is attained.

The subjects of traumatic inflammation are not unfrequently far advanced in years, unable to bear much depletion, and whose flagging powers of life are more likely to be benefited by tonic treatment. A favourable change in the state of the eye is often obtained by improving the diet of such patients, and putting them on bebeerine or quinine.

Abscess of the cornea is one of the most frequent consequences of traumatic inflammation, and is extremely apt to end in rupture of the front of the eye, leading to staphyloma, partial or total. The symptom in question is by no means very amenable to treatment. Besides bringing the eye under the anodyne and mydriatic influence of belladonna, and exhibiting one or other of the tonics above mentioned, I have witnessed the good effect of puncturing the cornea near its edge, but at a distance from the part infiltrated with pus.

An important general rule regarding the treatment of the traumatic ophthalmiæ, is that we should be on our guard against effects which are apt to be produced, but which may not yet be present, and against effects implicating the interior textures of the organ, although the injury has been, or at least has appeared to be, merely superficial. A considerable part of our treatment must be preventive. We must not delay to take away blood, till severe inflammation, with acute circumorbital pain, sets in. We ought to bleed from the moment of a severe injury. We must not wait till the pupil is evidently closing; but apply belladonna, and prevent it. We must not wait till the iris grows discoloured, or lymph is effused into the pupil; but from the very first put the patient on calomel and opium, if we apprehend from the nature of the injury that iritis is likely to be the result. Our attention should be confined, neither to the texture immediately affected by the injury, nor to that which seems most inflamed after an injury. I have known a minute fragment of steel sticking in the cornea, produce pretty severe iritis and sclerotitis, with scarcely any perceptible inflammation of the cornea; and while the iritis was properly enough treated, the cause remained overlooked.

In some causes of traumatic ophthalmitis the enormous swelling of the tissues surrounding the eyeball, the effusion into the ocular capsule, and the œdematous state of the conjunctiva, produce such pressure on the eyelids as to cause them to separate at their inner commissure, so that the lower one hangs loose and everted. In other cases, gangrene and sloughing of part of the lids take place.

Such violent and general inflammation of the eye is apt to result from injuries, chiefly in those of a scrofulous or otherwise unsound constitution.

It is a fact worthy of notice, that specific inflammations of the eye, such as syphilitic or arthritic iritis, may be excited by injuries.

It is not unworthy of observation that, after all the other symptoms of severe inflammation of the eye, following mechanical or chemical injuries, have been removed by depletion, counter-irritation, mercurialisation, &c., a very troublesome and obstinate intolerance of light, with epiphora, is apt to remain, not so much apparently from irritation arising from the state of the eye, as merely from continued and now habitual excessive activity in the lids and lacrymal gland. In such cases, in addition to the remedies recommended for epiphora, I have derived advantage from the internal use of the extract of stramonium.

SECTION XXXVII.—ARTIFICIAL OPHTHALMIÆ.

Soldiers have been detected exciting inflammation of the eyes, by the introduction of different substances within the conjunctival sinuses; or already affected with ophthalmia, they sometimes endeavour to aggravate the symptoms, or to prevent a cure, by the same practice; their object in all this, being to produce permanent injury to the eyes, or even loss of sight, so as to be discharged, and to obtain a higher pension than that to which they would otherwise be entitled.

The irritants employed for exciting inflammation of the eyes by soldiers are very various; as, corrosive sublimate, common salt, red precipitate, lunar caustic, sulphate of copper, quicklime, nitric acid, cantharides ointment, snuff, the juice and ashes of tobacco, a bit of woollen cloth, &c.

When a suspicion arises that a number of soldiers together are simulating puro-mucous ophthalmia, or endeavouring to produce serious injuries of their eyes, by the use of irritants, the suspicion will of course be increased, if the disease is almost exclusively confined to the privates or non-commissioned officers of a regiment, without affecting the commissioned officers, or the women and children; also by the circumstance of the inflammation being very frequently confined to one eye, and that almost always the right.

In many cases, it may be possible, from the suddenness and character of the symptoms, not only to detect the factitiousness of the disease, but to discover what particular substance had been used to induce it; or the substance itself may be found in whole or in part. For instance, Mr. Marshall[1] once detected a patient in hospital for ophthalmia, with a small portion of black muslin spread over the cornea of the right eye. This man had recently lost the power of vision in the left eye, probably from artificially excited inflammation.

When an acrid powder, as quicklime or red precipitate, is employed, it commonly occasions a sloughy ulcer in the lower fold of the conjunctiva, and sometimes particles of the foreign substance are found adhering to that membrane. Cantharides, in any form, suddenly induce a great degree of chemosis, with swelling of the eyelids, and most violent itching. A strong acid produces instant disorganisation of the conjunctiva, so that it becomes white and swollen, and is ready to peel off; at the same time, the cornea is whitened, and speedily sloughs.

In one instance, the depth and defined edges of the ulceration having led the surgeon to suspect the application of some acrid substance to the eye, the soldier was searched, and a paper of corrosive sublimate was found in his possession, with some manuscript directions for its use, in which it was recommended to put a minute portion into the eye on going to bed, to repeat it every third night, and to be cautious not to put in too much, lest the eye should be destroyed. There was annexed to this prescription a receipt for removing the artificial disease, consisting in a decoction of parsnips and leaves of clover, with which the eye was to be fomented.[2]

In the year 1809, three hundred of the men of two regiments on duty at Chelmsford became affected with ophthalmia. The healthy men of the corps were removed to another station, and the sick remained in hospital, but under military command. Information having reached their commanding officer, that one of the nurses of the hospital was in the habit of going to a druggist's shop for the purpose of purchasing medicines, suspicions were excited. Accommodation having been provided for about 24 men, the number contained in one ward, at midnight the officer made his appearance in the hospital, the men were roused from their beds, and forthwith marched in a state of nudity to the new ward. The old ward was secured for the night; and next day when the beds were examined, a number of small parcels of corrosive sublimate were found concealed. Means were taken to prevent a supply of this article, and in a very short time 250 of the men recovered.[3]

To excite disease of the palpebræ, the cilia are sometimes extracted, and caustic applied to the part.

The most effectual means of counteracting attempts to injure the eyes by the application of noxious substances, is the seclusion of suspected individuals. Handcuffs are sometimes necessary, or a tin mask for the face, so contrived as to prevent the patient's access to his eyes.

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[1] Hints to Young Medical Officers, &c., p. 112; London, 1828.

[2] Ballingall's Outlines of Lectures on Military Surgery, p. 437; Edinburgh, 1833.

[3] Ibid. p. 581.

SECTION XXXVIII. — REFLEX OR SYMPATHETIC OPHTHALMITIS.

Syn. — Iritis sympathetica.

I have now to direct the attention of the reader to a disease, which, as it generally proves, in the long run, intractable, and as it is the result, in the one eye, of a previous mechanical injury, which has already greatly impaired or destroyed the other, involves in its treatment a heavy responsibility on the part of the practitioner. Whenever I see sympathetic ophthalmitis, even in its first stage, I know that I have to contend with an affection which, however slight its present symptoms may be, is one of the most dangerous inflammations to which the organ of vision is exposed.

The general nature of the sympathetic affection which I am about to illustrate, by references to the journals of the Glasgow Eye Infirmary, is inflammation, commencing in the retina, but gradually involving the whole of the internal textures of the eyeball, especially the iris, crystalline, and vitreous body; coming on, generally, in five or six weeks after an injury to the opposite eye, and terminating, most frequently, in atrophy and total amaurosis of the eye secondarily affected. The one, also, which received the original injury generally ends, or has already ended, in amaurosis and softening of the globe. It is remarkable, however, that the amaurotic affection of the eye which suffers sympathetically, is generally more complete than that of the eye which had received the injury. The retina of the injured eye is sometimes tolerably sentient, while that of the other is totally insensible.

Case 293. — Henry Paterson, aged 25, admitted 31st January, 1827.

Two months before his admission, he struck the left eye against a nail which stood out from a door-post. The upper part of the iris is no longer in view, so that the pupil is much enlarged, and shifted to behind upper edge of cornea. Severe inflammation has followed the accident, and has communicated itself to the right eye, which, indeed, suffers more at present than the left. Both eyes exceedingly irritable on exposure to light, and affected with profuse epiphora. The right pupil small; both irides greenish, and both corneæ hazy. Retains a degree of vision in left eye. Bowels very bound. Leeches have been applied frequently to the temples.

On the 7th February, he is reported as improving, but very slowly. The treatment consisted in an emetic, followed by calomel, opium, and tartrate of antimony, with blisters, belladonna externally, and solution of nitrate of silver to the eyes.

We find from the subsequent reports, that his mouth becomes sore, and the pain diminishes. Afterwards, tenderness of the eyes increases and diminishes by turns.

On the 6th April, he is stated not to have improved for the previous fortnight. On the 16th, his mouth is sore, and his eyes decidedly improved. On the 30th, mouth well; inflammation continues to decline; vision of right eye very much better.

On the 11th May, left lens is mentioned as in an opaque state, and pressing the iris into contact with the cornea. After this, paracentesis corneæ was twice performed, but with little or no relief.

About the middle of June, the irritability of the eyes diminishes. This symptom had continued in a very distressing degree; but on the 11th July, the report states that he can now open his eyes, which he attributed very much to steaming them with laudanum. On the 20th, intolerance of light much abated, so that the right pupil can now be observed contracted, and filled with a fibrinous effusion.

August 15th. Can now distinguish objects of moderate size. Inflammation and intolerance of light continue to decline. This improvement took place under the continued use of calomel and opium, and a decoction of elm bark.

September 17th. Inflammation now gone; vision improves slowly. Centre of right anterior capsule opaque. Pupil somewhat contracted and adherent.

November 16th. Right pupil as at last report. Vision considerably improved.

February 25th, 1828. Vision improving.

During these 12 months, a great variety of remedies were employed. The principal were leeches, scarifications of the eyelids, paracentesis corneæ, blisters, tartar emetic eruption, a caustic issue, purgatives, calomel and opium, cinchona, elm bark, belladonna externally, solution of nitrate of silver, and vinum opii to the eyes, anodyne fomentations, and red precipitate salve. Whatever benefit arose from the treatment, was to be ascribed chiefly to the leeches, the calomel and opium, and the anodyne fomentations.

We saw nothing more of Paterson till the 8th September, 1830, when he was re-admitted, for the purpose of having an artificial pupil formed in his right eye.

The report, at his re-admission, states, that his right pupil continues very small, irregular, filled with lymph, and attached to the capsule. Within the last 12 months, his vision has greatly declined, so that when his back is turned to the light he can discern merely the reflection from the face of a person standing before him. The iris is of a green colour, but there is no vascularity on the surface of the eye. Says that upon catching cold, the eyes are apt to become tender.

On the 19th, I performed the operation of incision with Maunoir's scissors. I need not describe the operation, nor the difficulties with which it was attended. Any hopes of a restoration to sight by the operation were completely frustrated, in consequence of a blow which the unfortunate patient received on the right eye, from a person who was intoxicated, on the 28th March, 1831. This filled the aqueous chambers with blood, and completed the disorganisation of the eye.

Case 294.—Joseph Moore, aged 30, was admitted 14th December, 1834.

About three months ago, the right cornea was cut by a chip of cast steel. Some portion of the humours escaped. Violent inflammation followed, which has terminated in discoloration of the iris, and contraction of the pupil to a mere point, which is occupied by opaque capsule. Complete extinction of perception of light in this eye.

About a month after the accident, the pain, which was at first chiefly confined to the right orbit, extended to the left. The left iris is discoloured; the pupil irregular, contracted, not affected by light, and occupied by opaque capsule, apparently adherent to margin of iris. The opacity is less dense in the centre. With this eye he can distinguish the bars of the window, and count the fingers interposed between him and the light. Occasional circumorbital pain on both sides. Severe pain in bulb of left eye, especially at night.

Has been bled, and used some mercurial preparation, with temporary and partial benefit.

On his admission, he was bled at the arm, leeches were applied to left conjunctiva, belladonna extract was smeared round the eyes, and he was ordered a pill, morning and evening, containing calomel, opium, and belladonna leaf, of each a grain.

Under this treatment, he improved slowly, but he still complained of pain in the ball of his eyes. Two grains of belladonna leaf were substituted for 1 grain. His mouth became sore, and the pain was relieved. It soon returned, and seems to have been but slightly alleviated by opium and belladonna internally, which made up the chief part of the treatment during January.

On the 5th February, the report states, that considerable improvement had taken place in the vision of the left eye. Gentian, and afterwards quina, appear to have been employed on account of general weakness. No further improvement is noticed.

Case 295.—James Downie, aged 25, was admitted 5th January, 1837.

About three months ago, his right eye was wounded by a splinter of steel. It now presents a cicatrice at the junction of the cornea and sclerotica, towards nasal side of eye. The pupil is dragged towards the cicatrice, while the portion of iris most remote from the cicatrice appears on the stretch. There is some opacity towards lower part of pupil. No pain. Vision of right eye much impaired.

About seven weeks ago the left eye became affected. The iris is now discoloured; the pupil contracted and irregular. The form of the eye is altered, the anterior part being projected. The conjunctival vessels are enlarged, and there is a blueish zone round the cornea. Does not complain much of pain in left eye; its vision seems nearly extinct.

Has been bled, blistered, and mercurialised, and had improved considerably; but having gone to the country about ten days ago, he became much worse.

Leeches were applied to the left upper eyelid, and a blister behind the ear. Calomel and opium were prescribed, and Dover's powder at bedtime. These remedies were continued, along with repeated leeching and the external use of belladonna, during the month of January, with little or no effect on the eyes. On the 1st February, the report states that, with his back turned to the light, he distinguishes objects with the right eye, but not with the left. He is put on a solution of ʒij. of hydriodate of potass in ℥viij. of water, a table-spoonful thrice a-day; and the quantity of the hydriodate is increased gradually to ʒiv. There is no notice of any improvement; but, on the contrary, the surface of the iris is stated to have become vascular, a very unpromising symptom; and on the 16th, he is ordered to be bled at the arm, on account of increased inflammation of left eye. His mouth does not appear to have become sore. The bleeding at the arm relieves the pain of left eye. On account of costiveness, the calomel and opium pills are changed for blue pills. On the 22nd, his mouth is pretty sore; but there is no improvement in vision, and the irides are described as assuming a gilt green colour. He now complains of want of sleep, and is ordered opium and sarsaparilla. This last medicine appears to have been continued for nearly two months, but without benefit.

On the 22nd of April, the sarsaparilla is discontinued, and he is ordered one-sixteenth of a grain of oxide of arsenic thrice a-day. On the 6th May, the report states, that there is no change. The outer margin of each iris is occupied by a lavender-coloured ring. The left pupil is contracted and occupied by opaque capsule.

Called 21st August, 1842, to inquire if an artificial pupil could be formed in right eye. From its atrophied soft state, I advised him against this. Both eyes atrophic and soft, but the left more so than the right. Perceives light and shade with the right, but not with the left.

Case 296.—Robert Finlay, aged 24, admitted 5th July, 1837.

Last night, the right cornea was penetrated by a screw-driver, so as to form an angular flap, with the apex pointing downwards and inwards, while the extremities of the incision are separated by a space equal to the diameter of the cornea. Much blood is effused into the anterior chamber. The iris appears to be wounded; the state of the pupil cannot be discovered. Vision with this eye is reduced to a mere perception of light. The eyelids were brought together, and a bandage applied. Venesection. Six grains of calomel.

6th. Pain relieved. As the calomel had not purged, he was ordered 3 aloes and blue pills.

August 1st. Wound cicatrized; pupil very irregular; considerable vascularity of eye; little pain. Blister behind right ear. Collyrium muriatis hydrargyri.

5th. Eye less vascular. Lids adhere in the morning. Four grains solution of nitrate of silver.

Leeches were after this applied twice to the eyelids.

13th. Since yesterday, an attack of iritis sympathetica of left eye, with pain beneath the eyebrow during the night. Upper edge of pupil appears tagged to capsule. Ascribes this attack to having read a book, in small type, for three or four hours last night. Pulse 84. Venesection. Belladonna to left eyebrow and upper eyelid. Six grains of calomel, and 1 grain of opium, at bedtime. ℥i. of sulphas magnesiæ to-morrow morning.

14th. Blood buffy; pain greatly relieved. Cornea flexible; pupil tagged above and below. Eight leeches round left eye. Calomel and opium at bedtime, and salts to-morrow morning.

15th. Pupil transversely oblong; vision very dim. Venesection. Blister to left side of head. Four grains of calomel and half a grain of opium, thrice a-day.

16th. Blood buffy.

17th. Pain of left eye entirely gone; pupil still irregular. Mouth not affected. Calomel and opium continued.

19th. Was bled at the arm yesterday; blood buffy. Eye much less vascular; vision clearer.

20th. Cornea less flexible.

23rd. Pupil more regular; eye free of vascularity.

24th. Two grains of calomel, and a quarter of a grain of opium, daily.

27th. Mouth sore. Calomel and opium omitted.

31st. One grain of sulphas quinæ thrice a-day.

Sept. 1st. Lower part of pupil more regular.

4th. Very numerous minute whitish spots, apparently on the inner surface of left cornea, opposite lower edge of pupil. Belladonna omitted.

8th. Calomel and opium resumed.

12th. As the pupil contracts from the omission of the belladonna, vision becomes dimmer. Calomel and opium, morning and evening.

15th. Vision clearer.

26th. Calomel and opium stopped.

27th. One grain of opium. Alum gargle.

29th. No pain in right eye, unless when pressed with the hand. The minute white spots on inside of left cornea still very numerous. With this eye reads a very large type. Two grains of extract of stramonium morning and evening.

October 5th. Was attacked last night with violent pain in both eyes. At present the pain affects principally the left eye. Venesection. To foment the eyes with poppy decoction.

6th. Left conjunctiva this morning in a highly chemosed state. Venesection. Four grains of calomel and 1 grain of opium at bedtime, and half these quantities in the morning.

7th. A much better night; inflammation greatly abated.

10th. A recurrence of severe pain this morning. Leeches. Fomentation.

13th. Has again had a smart attack of pain. Pulse 84, feeble. Fomentation.

14th. Mouth sore. Calomel and opium omitted. Alum gargle. Blister behind left ear.

16th. No pain in eye. Mouth better.

18th. Another attack of pain this morning. Five leeches. Fomentation.

21st. Has continued easy since the application of the leeches.

25th. Again seized with pain in the forenoon, accompanied with vomiting in the evening. Four leeches. Fomentation.

November 8th. Has continued free from pain since last report.

10th. Some pain in right eye. Two leeches. Two grains of calomel and half a grain of opium at bedtime.

December 10th. At present, the right eye is entirely free from inflammation. Its cornea is bounded by an irregular line, and is reduced to half of its original size. Distinct perception of light and shade with this eye. The cornea of left eye is now unnaturally prominent, and surrounded by a reddish zone. The iris is greatly altered in colour, and is bulging forwards, so as to be very nearly in contact with the cornea. The pupillary margin seems to be adhering to the capsule, which is opaque in the centre. The perception of light is less, even than in right eye. Some palpitation of the heart for four or five weeks. Pulse 110, rather sharp.

Case 297. — Jane Gartshore, aged 15, admitted 30th April, 1838.

Six months ago, left cornea was divided, towards its outer edge, by being struck against the latch of a door. The iris had protruded, as it is now dragged towards the site of the wound, and fixed there. What remains of the pupil is occupied by opaque capsule. Large varicose vessels run towards the cicatrice. There are also numerous red vessels on the surface of the iris. This eye retains the perception of light and shade.

Four or five weeks after the injury, sympathetic inflammation came on in the right eye, and the vision of this eye, also, is now reduced to a perception of light and shade. The right iris is of a dingy green colour, with numerous varicose vessels running over it. The pupil is contracted, irregular, and adherent to an opaque capsule. Both irides are close to the corneæ.

Has now no pain. It was severe in the left eye, for nearly four months; but the right eye, she says, has never been affected with pain. General health was previously good. Pulse 120. Was twice bled at the arm; applied leeches and blisters; and took some medicine, which did not affect her mouth. Two grains of calomel and half a grain of opium, thrice a-day.

May 7th. Thinks her vision improved.

Case 298. — David Mill, an engineer, aged 38, admitted 30th August, 1838.

When residing in Edinburgh, 18 months ago, and whilst chipping iron, a splinter entered right eye, at outer edge of cornea. He continued to work for six weeks with his right eye tied up, when, the left eye beginning to inflame, he gave up working. About two months after receiving the injury, a swelling formed over the wounded part, which swelling being cut off, the splinter of iron, he says, was extracted.

The right pupil is dragged towards the cicatrice; the nasal portion of the iris is on the stretch; the capsule of the lens is opaque; the iris is close to the cornea, and is pretty natural in colour. The eyeball is of the healthy consistence, and the cornea not more flexible than natural. No pain in right eye. With this eye discerns the fingers indistinctly, and sees a pen as a long stalk. Thinks vision of right eye improving.

About a fortnight before the piece of iron was extracted from right eye, the left began to be inflamed, and has suffered severely. The iris is greenish; the pupil is nearly natural in size, but is misshapen, with its edge jagged, and fixed by adhesions to the capsule. Within the verge of the pupil, the capsule presents a whitish wreath, without any red vessels. The whole of the lens is hazy, and of a greenish hue; consistence of eye natural. With this eye, knows the Infirmary card to be printed, and reads a type about three-quarters of an inch in size.

Was at first affected with severe nocturnal circumorbital pain, for which he applied leeches, but was not bled at the arm. His mouth was made sore with mercury, which relieved the pain, and improved his sight. Left eye has been pretty free from redness till within four or five months ago. Within last month, its power of vision has declined, for at that period he could read an ordinary type. Pulse 84. Thirst. Appetite deficient.

A pill, every night, containing two grains of calomel and half a grain of opium. Belladonna collyrium.

31st. He had no eruption on his skin. This question was put, with reference chiefly to syphilis; as in one of the cases previously treated at the Infirmary, there was some reason to suspect a syphilitic complication.

September 4th. Complains more of photopsia in both eyes, with occasional headach. Less thirst; appetite improved.

5th. Still complains of flashes of light in both eyes. Blisters behind ears.

6th. Vision of both eyes, he thinks, improved. Mouth sore. Pill omitted.

11th. Three leeches to nasal angle of left eye.

18th. Complains more of pain in left eye.

19th. Left eye relieved. To take 20 drops, thrice a-day, of a solution of 15 grains of murias barytæ in ℥ss. of tincture of cinchona.

20th. Thinks vision of right eye somewhat improved since his admission. Sees the large letters, which he read at his admission, plainer. No visible change in either eye.

1. *Kind of injuries.*—The injuries which, affecting one eye, are most apt to excite sympathetic inflammation in the other, are penetrating and lacerating wounds, inflicted by cutting instruments, or by the forcible projection of splinters of iron or stone, or the fragments of percussion caps.

A mere blow on the eye (for instance with a stick) has been known to impair the other sympathetically. Mr. Wharton Jones has communicated to me the case of a gentleman by whom he was consulted, to whom it happened that, in firing a gun, the percussion cap struck one eye, making its way through the lower lid and sticking in the sclerotica, the result of which was internal inflammation first of the eye struck, and afterwards of the other. When Mr. Jones saw the patient, the eye which had been wounded was soft and atrophic, and the other was becoming so. On the 16th September, 1833, a quantity of sulphuric acid was thrown maliciously into the left eye of Mary Macshaffery, aged 26 years. The consequence was destruction of the cornea, and union of the whole of the upper eyelid to the remains of the eyeball. About the end of December, she began working in a cotton-mill, her usual employment. This produced a severe attack of sympathetic ophthalmitis of the right eye, ending in haziness of the cornea, discoloration of the iris, immobility of the pupil, and such deterioration of vision, that at her admission to the Glasgow Eye Infirmary, she could not make out the letters on the Infirmary card. Such facts illustrate the diversity of injuries which may give origin to sympathetic ophthalmitis. In general, however, it is from penetrating wounds that the disease we are now considering, takes its rise. Sometimes the wound is inflicted by such an instrument as a chisel or screw-driver, so that there can be no suspicion of anything being lodged within the eye; while, in other instances, the suspicion is strong, or there is an absolute certainty, that a foreign body has passed through the tunics, and lies there unextracted. Sympathetic ophthalmitis may occur, where the foreign body has been extracted immediately after the receipt of the injury, where it has lain for weeks within the eye and then been extracted, or where it still remains within the tunics.

The injuries now referred to are sudden and severe. They are often attended by a loss of part of the humours, and by an extravasation of blood into the interior of the eye. The parts divided have generally been the cornea and iris, with a small part of the sclerotica and choroid. The junction, in fact, of the cornea and sclerotica, and consequently the annulus albidus of the choroid, or ciliary muscle, is the place which has been wounded, in most of the cases which I have seen. I think sympathetic ophthalmitis is more apt to be excited, if the wound has produced a protrusion of the iris, and such a cicatrice of the cornea and sclerotica as keeps the portion of the iris which had not been protruded, perpetually on the stretch. If the wound has been so extensive as to divide or lacerate the retina, sympathetic inflammation is probably still more apt to occur. The injury which the lens suffers in such cases, and the traumatic cataract which follows, have little or no influence in causing sympathetic disease. A wound which implicates merely the cornea and lens, or even a wound of the cornea with simple prolapsus iridis, is not apt to excite sympathetic inflammation. Neither is a simple puncture of the sclerotica and annulus albidus, even though causing amaurosis, very apt to produce an affection of the opposite eye. I have never known any of the operations for cataract bring on this affection; not even when, after that of extraction, the iris protruded, and the cicatrice which followed caused dragging of the opposite side of the iris. The cases, then, in which I should particularly dread an attack of reflex inflammation, are those in which, along with a wound of the cornea, sclerotica, and anterior edge of the choroid, there is a loss of part of the vitreous humour, and a laceration and protrusion of the iris; especially if, about the time of the cicatrisation of the wound, the patient began to use the good eye in earnest, committed any irregularity in diet, overfatigued himself, or suffered from mental excitement or distress.

2. *Date of sympathetic inflammation.* — Were we to judge of the time which generally elapses between an injury of one eye and sympathetic inflammation manifesting itself in the other, from the six cases above related, we should say that five weeks was the most frequent period. In Paterson, the sympathetic affection came on three months after the injury; in Moore, the period was one month; in Downie, five weeks; in Finlay, five weeks; in Gartshore, four or five weeks;

in Mill, six weeks. In three out of six cases, recorded by Mr. Lawrence[1], the period is not mentioned; in the other three, the periods were a few weeks, five years, and soon after six weeks. In two cases recorded by Mr. Wardrop[2], the periods were three weeks, and one year.

3. *Subjects.* — The subjects of sympathetic ophthalmitis have most frequently been, in my experience, men employed in iron-works. At the time when their eyes were injured, their general strength was not impaired; but from their habits of life, and especially from their liberal use of spirits and tobacco, their constitutions were in an artificial state, very unfavourable for throwing off any inflammatory disease. It appeared to be from this cause that the sympathetic inflammation sometimes degenerated into the arthritic variety, and always proved so intractable. In some of the cases I have seen, the disease was modified by scrofula; a modification scarcely less troublesome than the arthritic. In one of the cases at the Eye Infirmary, Dr. Kennedy observed that the wounds made in bleeding the patient at the bend of the arm generally suppurated; which led him to inquire whether a syphilitic taint might not be present. The patient acknowledged having had some primary syphilitic symptoms before he received the injury of his eye; but he had no sore throat nor eruption, and the eye, sympathetically inflamed, showed none of the peculiar indications of syphilis.

4. *Exciting causes.* — It sometimes happens that the patient is unable to specify any exciting cause for the sympathetic attack; but, in other instances, causes of this kind are distinctly mentioned. For example, in Finlay, the exciting cause was manifestly the reading, for three or four hours together, in a book printed in a small type; and in one of Mr. Lawrence's cases, the eye had been incautiously worked. The wounds of the eye, which are apt to give rise to sympathetic ophthalmitis, commonly take from a month to six weeks to cicatrize. Whenever they are healed, the patients generally recommence their usual employments and modes of life; and then it is that the exciting causes of the sympathetic disease come into play.

The same sort of exciting causes which produced the first attack of sympathetic inflammation, also bring on relapses when the patient is recovering; and it is generally by a succession of relapses that vision is destroyed.

5. *Symptoms.* — The local symptoms of the sympathetic disease are those of retinitis and iritis, passing into amaurosis and atrophy of the eye. The first symptom is generally dimness of sight. This is rapidly followed by zonular redness around the cornea, dingy greenness of the iris, flexibility of the cornea, bogginess of the sclerotica, opacity of the capsule, greenishness of the lens, varicosity of the rectal vessels ramifying over the surface of the eye, contraction and adhesion of the pupil, puckering and bolstering forwards of the iris, and total insensibility of the retina. The pain is very variable; for in some it is slight, as in Gartshore, who said she had had no pain in the eye sympathetically affected; while in others it is severe, as in Finlay. A throbbing or heaving is felt behind the eyes, synchronous with the pulse. Photopsia is a usual symptom about the commencement of the

attack. In some, there is great intolerance of light; in others, there is little. At length, the shrinking of the eyeball, and especially of the cornea, is very remarkable. In one of Mr. Lawrence's cases, each cornea had shrunk to the size and figure of a barley-corn placed horizontally.

There can be no doubt that inflammation of the retina forms a chief part, in all cases of sympathetic ophthalmitis. Retinitis appears to occur first, and added to it is iritis. The early loss of vision shows that the retina is deeply implicated from the very commencement. The flexibility of the cornea, and softness of the sclerotica, indicate the vitreous fluid to be lessened in quantity. The changes which are visible in the capsule and in the iris are plain indications how far these textures are affected.

Sympathetic ophthalmitis is generally an inflammation of that kind which is called *unhealthy*. It sometimes resembles scrofulous internal ophthalmia; more frequently, it resembles arthritic ophthalmia. The symptoms are often such, that one skilled in German ophthalmology, would at once say, here is arthritic iritis. As I have before remarked, if we use the term *arthritic* merely as a conventional one, to express a certain variety of eye-disease, characterised by certain signs, this may be allowed; but if by arthritic is meant strictly *gouty*, applied to the cases we are now considering, the term is incorrect. The subjects of sympathetic ophthalmitis may have some peculiarity of constitution, produced by their mode of life, and by the nature of the ingesta to which they have habituated themselves; but there are not sufficient grounds for supposing that they labour under the gouty diathesis. It is more probable that the particular textures of the eye which are affected, and the modes in which these textures are suffering, produce the peculiar symptoms which present themselves so strikingly in such cases, and which the Germans call arthritic.

Amongst the constitutional symptoms may be mentioned quickness of pulse, thirst, a marked buffy coat on the blood drawn from a vein, a pallid complexion, and obstinate constipation. A degree of ill health, in fact, has generally resulted from the confinement, want of exercise, and medical treatment necessary for the cure of the original accident; and in this debilitated state the patient is attacked by the sympathetic disease.

6. *Ratio symptomatum.* — The fact, that disease in one eye is liable to be followed by similar disease in the other, has long attracted attention. Inflammation, cataract, and amaurosis, have especially been observed to occur in this way, from what is termed a *consensus oculorum.*

A little girl, who was an out-patient at the Glasgow Eye Infirmary, presented a curious instance of the tendency to symmetrical disease of the two eyes. She was affected with trichiasis, xeroma of the palpebral conjunctiva, and thickening and opacity of the cornea. At her admission, and for several years after, the symptoms were confined to the left side, the right eye being perfectly well. But, by and by, the same set of symptoms began to show themselves in the right eye, only in a less degree. The corresponding eyelashes were inverted, the corresponding part of the conjunctiva became dry, and the corresponding portion of the cornea opaque.

Two patients, attending the Eye Infirmary about the same time as the child whose case I have just noticed, afforded instances of sympathetic amaurosis, and oscillation of the eyeball. In one of these patients, the left eye was destroyed by a blow; and eight days after, the right eye was found to be affected with oscillation, and a great degree of dimness of sight, but without inflammation. Less was known of the other patient's history, as the injury which destroyed the sight of his left eye, and produced almost a complete absorption of the iris, occurred in childhood; but he afforded another example of sympathetic oscillation and amaurosis.

Dr. Albers relates[3] the case of a country-man, who, in a scuffle with his brother, was struck with a pitchfork in the right eye, whereby the cornea and iris were seriously injured. The wound healed in such a way that the sight was not entirely lost. In three days after the injury, the patient observed diminution in the vision of the left eye, and an opacity was discernible within the pupil. The opacity increased so rapidly, that in eight days there were all the signs of a fully formed cataract. Half a year afterwards, he was operated on by Professor Jung, of Marburg, but unsuccessfully, the patient remaining completely blind. Albers asks, if this case does not go to prove a decussation of the optic nerves, to which Himly replies in the negative. For suppose (says he) that the cataract, the sudden formation of which is very remarkable, was really a consequence of the injury, and not only so, but that the injury was the sole cause of the cataract, and did not operate merely in exciting a tendency already existing to opacity, we find similar appearances of *consensus* frequently in the corresponding teeth of the two sides, where no such decussation or nervous communication can be brought forward in explanation.

Notwithstanding this objection of Himly, it is generally acknowledged that those organs of the body are most apt to affect others, or in their turn to be affected sympathetically, in which the nervous system is most developed; that there are no organs between which a sympathy in different states of disease exists so remarkably as the two eyes; and that there are no organs in which the nervous system is more developed, none in which the nerves of the opposite sides are connected in the same intimate way.

In the cases now under our consideration, it is not improbable that the blood-vessels on the side of the injured eye, being in the state of congestion which attends inflammation, communicate to those of the opposite side, with which they have connections within the cranium, a disposition to the same state in which they themselves are. The ciliary nerves also of the injured eye, may be the means of conveying to the third and fifth nerves, an irritation which may be reflected from the brain to the same nerves on the opposite side. I think, however, that the chief medium through which sympathetic ophthalmitis is excited, is the union of the optic nerves. The researches of modern anatomists have tended only to confirm the conjecture of Newton[4], that the optic nerve of the one eye, proceeding backwards and meeting the optic nerve of the other eye, the two mingle their fibres, and partially decussate. It is extremely probable that the retina of the injured eye is in a state of inflammation, which is propagated along the corresponding optic nerve to the chiasma, and that thence the irritation which gives rise to inflammation, is reflected to the retina of the opposite eye, along its optic nerve.

7. *Diagnosis.*—The history of the case will, in general, be sufficient to prevent any difficulty in the diagnosis. Sympathetic ophthalmitis may be complicated with scrofula, and assume a good deal of the scrofulous character; or it may be complicated with syphilis, which an examination of the patient's skin and throat, and an inquiry into his previous health, will serve to elucidate. These complications, as well as the arthritic, will no doubt render the symptoms more severe; but they will scarcely influence the line of treatment to be followed.

8. *Prognosis.*—The prognosis is so unfavourable, that it is our duty to guard the patient who has suffered any severy injury of one eye, against the exciting causes of sympathetic ophthalmitis, from the very first. When this disease is actually present, even the most active treatment is generally ineffectual. I have very seldom seen an eye recover from sympathetic ophthalmitis. Renewed attacks have generally terminated by extinguishing vision.

9. *Treatment.*—Rest, antiphlogistic means, the internal use of mercury, and the external application of belladonna, are the principal points of the treatment. These means, we have abundant proof, are not very successful. Still, to relinquish these remedies would be wrong.

A little boy, at the Glasgow Eye Infirmary, after his mouth was made sore by mercury, was much benefited by iodide of potassium.

The only case in which I have witnessed a complete cure of sympathetic ophthalmitis, was the result, in the right eye, of the left being punctured, close to the edge of the cornea, with a packing-needle, the pupil being permanently dragged towards the wound. After depletion and mercury had been pretty extensively employed, I put the patient on the combined use of calomel and sulphate of quina, and had the satisfaction of seeing the symptoms yield entirely to this plan of treatment.

I have found the inhalation of the vapour of sulphuric ether to alleviate, in a marked manner, the symptoms of sympathetic ophthalmitis.

There is a disease, Mr. Wardrop informs us[5], frequent in the eye of the horse, having the appearance of a specific inflammation, which usually first affects one eye, and then the other, and sooner or later destroys vision. It is known to farriers, that, if the eye first affected suppurates and sinks in the orbit, the disease does not attack the other, or subsides if it had commenced in it. They therefore adopt the practice of destroying the diseased eye, in order to save the other. They do this rudely, by putting lime between the eyelids, or thrusting a nail into the eyeball, so as to excite violent inflammation and suppuration. Mr. Wardrop has frequently succeeded in saving one eye of the horse by adopting this practice; but he destroyed the eye by making an incision in the cornea, and discharging through it the lens and vitreous humour. "In some diseases of the human eye," says he, "where the disease makes a similar progress, first affecting one eye and then the other with complete blindness, the practice so successful in animals might, by judicious discrimination, be beneficially adopted."

The practice thus hinted at by Mr. Wardrop, has actually been adopted, though with a somewhat different view, by Mr. Barton, of Manchester, in cases of injury of the eye with the fragments of percussion caps. The reader will find an account of Mr. Barton's mode of treating such cases at page 412.

Mr. Crompton states[6], that in one of the cases which he witnessed under Mr. Barton's care, the vision of the uninjured eye was nearly lost from sympathetic inflammation, and adds that he thinks it most likely that the other cases would have terminated similarly, if the plan of laying open the injured eye had not been adopted. Mr. Barton, it is true, opens the injured eye, with the view of extracting the fragment of the cap, on the presence of which he considers the sympathetic inflammation to depend. He not only opens the cornea, but cuts away a large flap of it. He then applies a poultice, and waits till the fragment is discharged. In the cases published by Mr. Crompton, this practice appears to have, not only relieved the patients of the pain they were suffering in the injured eye, but to have arrested the reflex disease which threatened the other. This, then, affords good ground for following a similar plan, not only in cases where we have reason to believe that some foreign body is lodged within the eye, but even in other cases, where the one eye being disorganised and deprived of sight, the other eye seems likely to be destroyed by sympathetic inflammation. Where there is a suspicion that some foreign body is lodged within the injured eye, there can be no question that Mr. Barton's practice ought to be adopted; but even in other cases, why should we hesitate to lay open an eye in which vision is extinguished, if the operation affords a reasonable hope of our being thereby able to save the other?[7]

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[1] Treatise on the Diseases of the Eye, p. 147; London, 1833.

[2] Morbid Anatomy of the Human Eye; Vol. i. p. 117; Vol. ii. p. 140; London, 1818, 1819.

[3] Himly und Schmidt's Ophthalmologische Bibliothek; Vol. ii. No. 3. p. 169; Jena, 1804.

[4] Opticks; query 15.

[5] Op. cit.; Vol. ii. p. 139.

[6] London Medical Gazette; Vol. xxi. p. 175.

[7] See cases of sympathetic ophthalmitis, treated by incision of the injured eye; French translation of this Work, p. xxi; Paris, 1844: Association Medical Journal, May 13, 1853, p. 411.

SECTION XXXIX. — INTERMITTENT OPHTHALMIÆ.

At the period when I sent to the press the earlier editions of this Work, although several interesting cases had been recorded of ophthalmia recurring in the same individual after longer or shorter intervals of time, yet I did not think there was sufficient ground to admit the existence of any disease of this kind so regularly periodic in its accession, as to warrant the appellation of *intermittent ophthalmia.*[1] Although I have since seen cause to change my opinion, the following remarks are still appropriate: —

The pain which attends many of the ophthalmiæ is undoubtedly subject to regular nocturnal exacerbations; but this does not entitle these diseases to the appellation of intermittent. By an intermittent or periodical ophthalmia, I should understand one which recurred with considerable regularity at intervals of days, weeks, or months, and apparently not from accident, but from concatenation with the revolutions of time; whereas, if we examine the generality of cases recorded as of this kind, we shall find that they are nothing more than instances of some particular ophthalmia recurring more or less frequently in the same individual, in consequence of his repeatedly exposing himself to the same, or to some similar exciting cause. Phlyctenular ophthalmia, being that which is most apt to be renewed on slight exposures, will also frequently appear to be periodic; rheumatic, catarrho-rheumatic, and catarrhal may also, from their ready occurrence in eyes once affected with them, seem intermittent. I have frequently treated patients who, at intervals of three or four months, or once a year, and nearly about the same season for several successive years, had suffered an attack of rheumatic iritis; but in every case of this kind, I have been able to trace the return of the disease to some new imprudence. In arthritic inflammation of the eyes, there may also appear to be a periodic tendency; for every attack leaves the eyes worse than before, and with a strong disposition to suffer again from renewed causes of excitement.

These remarks will be confirmed by a perusal of the narratives of Dr. Curry and Dr. Bostock, both of whom had suffered from repeated attacks of severe ophthalmiæ.[2] Some other cases, published as illustrations of intermittent ophthalmia, seem to have been rather instances of neuralgia, attended, as this disease often is, with inflammation of some of the textures of the eye.[3]

The following case first induced me to change my opinion regarding the non-existence of intermittent ophthalmiæ.

Case 299. — A gentleman came from a distance, to consult me, in July, 1835. His age was 24, and he stated that he had been troubled with scrofulous ophthalmia till he was 10. After that age, he remained free from ophthalmia till within 10 months of the period when he consulted me. For these 10 months, the conjunctivæ had been affected with considerable redness, and this symptom presented exacerbations of a distinctly periodic character. The redness was of a carmine hue, and differed from that of any ordinary ophthalmia. The eyes were never entirely free from redness; but regularly, every six or seven days, there was an exacerbation, first in the one eye, and then in the other. A patch of redness was first observed on one of the conjunctivæ, the redness spread rapidly till the whole membrane was affected, and then the other eye underwent the same process. Some swelling of the conjunctivæ attended these attacks, along with a degree of heat and pain in the eyes. There were no rigors, nor headache. There was not much intolerance of light. The blood-vessels of the conjunctivæ showed a tendency to pass over the edge of the corneæ. There were no phlyctenulæ, and no increased discharge from the conjunctivæ. The scleroticæ appeared neither thickened nor thinned. There was no affection of the corneæ, except some minute specks of opacity at the edge of the right one. There was no disease in either iris, and the vision was perfect. The attacks came to a crisis in about 36 hours from their commencement, the redness after this gradually decreasing till the eyes recovered something like their proper colour, and the whole process occupying generally six or seven days. There seemed, the patient remarked, to be some cause residing in the eye itself, which produced inflammation, exclusive of any external irritant, and which no care could counteract; for when the eyes were at the palest, he was sensible of a slight pricking sensation, the certain forerunner of another attack. Thus matters had gone on for 10 months.

The remedies which had been tried, were leeches round the eyes; mercury, sulphate of quina, and arsenic, internally; along with solution of nitrate of silver, solution of sulphate of zinc, and vinum opii, externally: all without effect. Venesection was now had recourse to, and seemed to do good for some time, but the benefit was only temporary.

The patient again consulted me in March, 1838. His disease had continued with little change. Perhaps the intervals between the exacerbations were a little longer, approaching nearer to seven than to six days. There was now a remarkable increase of the opacity formerly observed at the edge of the cornea. On each cornea there was now a sort of arcus, deficient above, but occupying to a considerable breadth the rest of the circumference. These rings were of a peculiar yellowish-white colour, so as to resemble pus or bone in appearance. They had been increasing for 18 months.

The patient had consulted several of the most eminent surgeons and oculists in these countries, but without deriving any benefit from their prescriptions. He had been cupped by the advice of one, and was using steel by the advice of another. My friend Dr. Staberoh, of Berlin, saw him along with me, and recommended a trial of iodine internally, with a tartar emetic eruption on the nape of the neck. The patient wrote to me, some time after, to say that these remedies had likewise been fruitless.

On the 10th of July, 1839, his medical attendant wrote to me, that the disease continued to make progress.

Such was the first case of distinct intermittent ophthalmia which came under my observation. It corresponds with the cases seen by Benedict, in affecting only the external parts of the eye, and in manifesting the symptoms of a *taraxis.*[4] Its type is sextan or septan. It corresponds with the disease described by Staub[5] as a congestion rather than an ophthalmia. This author would call it a local intermittent fever.

Case 300.—A gentleman, about 50, consulted me in December, 1838. Both his conjunctivæ presented a very considerable redness, rather of a livid hue, and neither distinctly reticular nor zonular. The conjunctivæ looked as if they were dyed red, rather than inflamed. The redness was less on the upper half of the eyeballs than on the lower half, but the chief redness was on the temporal side. There was not much thickening of the conjunctivæ, and no chemosis. There was no morbid secretion; no glueing of the eyelids in the morning. There was no pain in the eyes, nor feeling of sand. A narrow white ring was observable between the sclerotica and cornea. The cornea, iris, and pupil of each eye were natural; and the vision perfectly good. The patient complained of a feeling of coldness in his eyes, which he relieved by heating them at the fire; a practice his medical attendants used to laugh at. They felt better, however, and the redness always diminished, when he passed into the open air. They became weak, if, after coming within doors, he used them in reading for half an hour, and the redness then increased. Gaslight was pleasing, not painful to them. They showed alternations of better and worse, but the exacerbations were not regular. If there was any intermittence, it was daily; the relief being experienced when the patient was out of doors in the forenoon. Winds, even the east wind, did not hurt his eyes.

The ophthalmia was of two months' standing. The patient had been long subject to neuralgic pains in the chest, back, and sides. Pulse 66. He felt no rigors, but rather a pleasing heat of skin. His skin was dry, and he perspired with difficulty, except on taking exercise.

In this case diaphoretics and colchicum had been tried, with various local applications; but without any effect.

I understood the patient continued in the same state five months after I saw him. From the peculiar appearance of the eyes, I considered the disease to be essentially the same as that which existed in the preceding case, although the intermittent character was but obscurely declared.

Case 301.—A lady of rank, who each summer, for two years, had taken large doses of sulphate of quina for hay-fever, became suddenly affected with dimness of sight in the right eye, followed by external appearances of inflammation. When she came under my care, in May 1842, the attack of inflammation involved chiefly the retina, iris, and anterior crystalline capsule. The pupil was contracted and irregular, the iris was discoloured, and its edge appeared thinned, and was studded with minute reddish points. These symptoms, as well as the dimness of sight, yielded to leeching, calomel with opium, and belladonna. After being some short time under my care, I discovered that the disease suffered a distinct exacerbation every seventh day. Each paroxysm began with slight redness and œdema of the conjunctiva, followed by more or less pain in the eye, generally nocturnal, and by an increased dimness of sight. These symptoms went on increasing for two days, and then subsided till the seventh day, when they regularly returned, often with a slight rigor. These relapses were in a great measure warded off by small doses of sulphate of quina.

In December, the same set of symptoms occurred in the left eye, with tags of the pupillary margin to the capsule, and were overcome by the same remedies as had before been used for the right eye. On the tenth day of the treatment, the tags gave way, and the eye was free from redness, and seemed perfectly well. Next day, the patient had a rigor, followed by pain in the eye, with redness and slight œdema, and the pupil again showed itself irregular and contracted. By means of the calomel with opium, and the belladonna, the eye was again restored, and the patient was put on sulphate of quina, previously to leaving Glasgow.

Two years afterwards I was sorry to learn that the disease had returned, and had ended in amaurosis.

This case was evidently one of chronic intermittent ophthalmia, of iritic character, and septan type.

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[1] The frequently recurring inflammation of the eye of the horse, which at last ends in *moon-blindness*, was formerly supposed to be periodic, and to be governed by the changes of the moon.

[2] History of a case of Remitting Ophthalmia, and its successful Treatment by Opium; by James Curry, M.D.; Medico-Chirurgical Transactions, Vol. iii. p. 348; London, 1812: Case of a Periodical Affection of the Eyes and Chest; by John Bostock, M.D.; Ibid. Vol. x. p. 161; London, 1819.

[3] See Hueter, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xii. p. 271; Vol. xiii. p. 93.; Berlin, 1828, 1829.

[4] Benedict's Handbuch der praktischen Augenheilkunde; Vol. ii. p. 6; Leipzig, 1823.

[5] Zeitschrift für die Ophthalmologie; Vol. iv. p. 371; Heidelberg, 1835.

CHAPTER XIV.

DISEASES CONSEQUENT TO THE OPHTHALMIÆ.

Some of the consequences of the ophthalmiæ are direct; others, remote. Onyx, for example, or effusion of matter within the cornea, is a direct consequence of severe inflammation of the exterior textures of the eye; hernia of the iris is a remote consequence, which cannot take place till the cornea is penetrated by ulceration; while staphyloma of the iris and cornea is still more remote, never occurring till the process of cicatrisation has formed a pseudo-cornea over the iris, exposed by partial or total destruction of the natural cornea, and, in many cases, not for a considerable number of weeks or months after such a formation is effected.

In all the cases falling under the head of *Diseases consequent to the ophthalmiæ,* it is a question of importance, Is the ophthalmia subdued? If not, then the remedies which are indicated in the particular species of ophthalmia still present, however long it may have continued, and however much neglected or mistreated, are, in all probability, the most likely means to remove also the consequences which the ophthalmia has produced. If, on the other hand, all active symptoms are gone, and merely certain sequelæ remain, it is often necessary to try some mode of treatment totally different from what might have been pursued with advantage, had the disease still existed in the inflammatory stage. To recur again to onyx and staphyloma, as illustrations, we have frequent opportunities of witnessing the complete dispersion of the former by the employment of proper antiphlogistic means, while the latter is totally beyond the influence of any such mode of treatment.

It is worthy of notice, that certain of the consequences of the ophthalmiæ are occasionally to be regarded as causes as well as effects; a fact analogous to what is observed with regard to other organs. Thus tubercles in the lungs are both excited by inflammation, and in their turn are the cause of inflammatory attacks. Granular conjunctiva, an effect of conjunctivitis, is a cause of corneitis.

SECTION I. — ONYX, OR ABSCESS OF THE CORNEA.

῎Ονυξ, the nail. *Syn.* — Unguis. Lunula.

Fig. Wardrop, Pl. VI. *fig.* 1. Demours, Pl. XXIV. *figs.* 1, 2. Pl. XXIX. *figs.* 1, 2. Pl. XXX. *fig.* 1. Ammon, Thl. I. Taf. II. *fig.* 18.

The term *onyx* signifies a deposition of pus in the spongy substance, or between the lamellæ of the cornea. Such an abscess must always be attended by partial destruction of the interlamellar substance. It generally makes its appearance at the lower edge of the cornea; and however small, may easily be distinguished from commencing hypopium, or abscess of the anterior chamber, by its exact similarity in form to the white spot seen at the root of the nails. Even when the quantity of pus is more considerable, an onyx may be known by its superior limit being convex, and by its remaining unchanged in form and situation, whatever be the position of the patient's head; whereas, when the patient has been for some time at rest in the erect position, hypopium presents a horizontal limit superiorly, although this form may be somewhat changed, by the matter gravitating to one or other side, according to the direction in which the head is placed.

Although the lower edge of the cornea is by far the most frequent seat of incipient onyx, it sometimes happens that pus is collected in a circumscribed spot over the pupil, or at any other part of the cornea, while, in other cases, we see onyx commencing perhaps above the centre of the cornea, and diffusing itself irregularly over a large extent. This is particularly the case with onyx originating in a scrofulous phlyctenula, or following small-pox. Such an onyx is apt, instead of bursting through the exterior lamellæ, to infiltrate a considerable portion of the substance of the cornea. After a time, the matter is generally absorbed, and the corneal substance which was separated by its presence, comes together again, adheres by means of effused lymph, and presents a peculiar variety of albugo, which seldom entirely disappears.

Onyx takes place most frequently in acute and neglected cases of the puro-mucous ophthalmiæ, and especially in the ophthalmia of new-born children. It occurs not unfrequently in catarrho-rheumatic, variolous, and traumatic ophthalmia; occasionally in phlyctenular ophthalmia; rarely in any of the others.

Under the use of the remedies most applicable to the particular ophthalmia in which it originates, incipient onyx is often removed by absorption, in the course of a few days, or even in a few hours. But, in neglected cases, more and more matter is effused, so as to extend over the cornea, or mount gradually from its lower edge till it covers the pupil, separating the lamellæ, or perhaps rather infiltrating the substance of the cornea, till at length this part of the eye is completely put on the stretch, and looks like an abscess ready to burst. As the onyx increases, the pupil uniformly contracts and becomes filled with lymph. The pain of the eye and head is at the same time severely aggravated. At length it sometimes happens, although very rarely, that the posterior lamellæ of the cornea give way, and the matter falls into the anterior chamber, so as to form a spurious hypopium. This event is sometimes supposed to have taken place when, in fact, onyx is combined, as in cases of catarrho-rheumatic and traumatic ophthalmiæ it not unfrequently is, with true hypopium. Much more frequently ulceration commences on the external surface of the cornea, and over the middle of the onyx; in the progress of ulceration, the cavity containing the pus is opened, and the matter is slowly evacuated. Not unfrequently the ulcer which has served to open the onyx, goes on to penetrate completely through the cornea, so that the aqueous humour is discharged, the iris falls forward into contact with the ulcerated cornea, adhesion between them ensues, and the case ends in partial staphyloma. If a great part of the cornea is destroyed, the staphyloma will be total. The result, however, of the bursting of an onyx externally, is not always so unfortunate. It sometimes happens that, as soon as its contents are discharged, the inflammation begins to subside; the pupil clears; and although some degree of leucoma is always left, it may be very limited, so that a fair degree of vision shall be preserved.

Treatment.—The remedies most likely to subdue the ophthalmia in which the onyx has originated, must be carefully employed. Bleeding, nauseants, purgatives, counter-irritation, and mercurialisation, besides their antiphlogistic powers, frequently appear to act favourably, by promoting the absorption of the purulent effusion in these abscesses of the cornea. Belladonna ought to be used to obviate contraction of the pupil. Warm anodyne fomentations are of great use.

Ought abscesses of the cornea to be evacuated by the knife? All agree that this ought never to be ventured on when they are small; that is to say, when, having commenced at the lower edge of the cornea, they have perhaps not mounted higher than opposite to the lower edge of the pupil, in its medium state of dilatation. Larger onyces than this, I have repeatedly opened with the lancet; and in every case in which I have done so, so much of the cornea was destroyed that staphyloma was the result. I have, on the other hand, left onyces untouched, although they were so extensive as to cover the pupil completely, and have sometimes had the satisfaction of witnessing an almost perfect recovery of the eye. The following is a case which I treated on this plan:—

Case 302.—John Ferrie, aged 47, was admitted at the Glasgow Eye Infirmary, 22nd May, 1826, on account of catarrho-rheumatic ophthalmia of the left eye, with which he had been affected for about three weeks. For eight days he had had severe orbital pain during the night. There was an onyx, extending from the lower edge of the cornea so high as to cover the pupil, and over the middle of the onyx there was a small ulcer. The conjunctiva and sclerotica were very vascular. Vinum opii was dropped upon the eye, and extract of belladonna smeared on the eyebrow and lids. He was ordered to rub the forehead and temple every night with tincture of opium, to bathe his feet in hot water, and to take two grains of calomel with one of opium, on going to bed. On the 24th, he felt the eye better, although there was not much evident change in its appearance. The iris was discoloured, and there was a lymphatic effusion into the pupil. He was ordered to take the calomel and opium morning and evening, to apply a blister to the nape of the neck, and to continue the other remedies. On the 27th, the mouth was affected, but the onyx had increased. Eight leeches were applied to the left temple; the morning dose of calomel and opium was omitted. On the 31st, the pupil appeared to be contracting. On the 2nd of June, the upper part of the cornea was observed to be nebulous, and the eye felt more uneasy. The nitras argenti solution was applied in the place of the vinum opii. By the 5th, the exterior laminæ of the cornea had given way, and a considerable quantity of matter had been discharged from the onyx. The pupil was still more contracted. He complained of a feeling of sand in the eye. He was ordered an aqueous solution of extract of belladonna as a collyrium. On the 7th, the blister was re-applied. By the 9th, the aqueous humour had evacuated itself, and the iris fallen forward into contact with the cornea. The matter of the onyx had almost entirely disappeared, and he said he saw a little better. On the 12th, the pupil, still in contact with the cornea, appeared clearer, and vision was more distinct. On the 14th, a little aqueous humour was present between the upper part of the iris and the cornea; the ulcer of the cornea was covered with lymph; and all the pus gone. On the 26th, the pupil was considerably larger and clear; more aqueous humour was present between the iris and cornea. By the 30th, the pupil was clear, and of considerable size. A minute adhesion between the slight leucoma on the cornea and the lower edge of the pupil was observed when the eye was examined laterally. The vision of the eye was good.

In this instance, then, I left the abscess of the cornea to itself, and certainly no case could have been more alarming in its progress, nor more unexpectedly favourable in its results. The causes of such success I have endeavoured to explain at page 515.

When the abscess, however, does not incline to open of itself, but appears about to involve the whole cornea, an artificial exit must be afforded to the matter, were it merely to save the patient from the continuance of the violent pain which attends this symptom. The incision may be made conveniently with the iris-knife, and ought to comprehend only the external laminæ of the cornea. No pus is in general discharged at the moment of making the incision; but it forms, in the course of some minutes, a small drop, which may be wiped away from the cornea. The operation, in most cases, requires to be several times repeated, before the onyx is entirely evacuated, and ought to be held out to the patient more as a palliative for the pain, than as a means of saving the sight, which, in such circumstances, is generally lost.

The effect of evacuating the aqueous humour, by puncturing the healthy part of the cornea in the early stages of onyx, does not appear to be ascertained. It would, at least for a time, relieve the tension which attends severe inflammation of the eye; and as onyx makes its appearance only in severe cases, it might have a good effect upon this dangerous symptom. To trust, however, almost solely to this, or to any other local means, without assiduously combating by general remedies, the ophthalmia in which the onyx has originated, would be highly improper.

Mr. Guthrie's plan of dividing the whole thickness of the cornea, in cases of onyx, I have already explained at page 515.

SECTION II. — HYPOPIUM.

Hypopium, from ὑπὸ, *under*, and πύον, *pus*. *Syn:*— Oculus purulentus. Das Eiterauge, *Ger.*

Fig. Demours, Pl. XXX. *figs.* 2, 3. Pl. XXXI. *fig.* 1. Ammon, Thl. I. Taf. VIII. *fig.* 3. Dalrymple, Pl. XVIII. *figs.* 2, 3. Sichel, Pl. IX. *figs.* 5, 6.

Hypopium is a much rarer disease than onyx. We distinguish two varieties of it; the *true*, and the *spurious*.

1. By *true hypopium* is meant a collection of pus or of puro-lymph in the chambers of the aqueous humour, and most frequently in the anterior chamber, secreted by the lining membrane of the cornea, the iris, the capsule of the lens, or the ciliary processes. The most frequent sources appear to be the iris and the cornea. The purulent matter is observed first at the bottom of the anterior chamber, and is thereby easily distinguished from the curd-like effusion of coagulable lymph, which occasionally occurs in iritis, and drops down from the pupil in a considerable mass. So long as the patient remains at rest in the erect position, the superior limit of the matter in true hypopium constantly presents a horizontal line. In some cases it is seen to shift its position, on inclination of the head from side to side; while, in other instances, it is so thick and glutinous, that it undergoes no change of this kind. It may increase gradually till it not merely covers the pupil, but fills the anterior chamber. If the case be neglected, the cornea is rendered unnaturally prominent, and its substance becoming infiltrated with pus, it presents exactly the appearance of an abscess. At last, under almost insupportable pain, the cornea gives way; the pain now ceases; the iris, falling forward, adheres to the remains of the cornea; and staphyloma generally ensues.

It is rare to meet with true hypopium, uncombined with some affection of the cornea; and this disease never proceeds to such a degree as to burst externally, unless complicated with onyx. Most frequently the collection of pus remains nearly the same in quantity, not only for days, but weeks; during which time the iris becomes more and more inflamed, its motions more and more impeded, and at last, if the matter be absorbed, the pupil is found to be obliterated. When onyx or ulcer of the cornea is present along with true hypopium, there is much danger of the cornea being destroyed, and the case ending in staphyloma. This combination occurs not unfrequently in severe catarrho-rheumatic ophthalmia. In the ophthalmia occurring from injuries with the stalks or ears of wheat during harvest, I have repeatedly seen onyx with hypopium.

2. The name *spurious hypopium* is applied to a collection of pus in the anterior chamber, arising from the bursting of an abscess of the iris or of the cornea into that cavity. Abscess of the iris I have described at pages 540 and 544, and abscess of the cornea in the last Section. Hypopium of this sort seldom, if ever, reaches so high as the lower edge of the pupil. When onyx, however, exists along with spurious hypopium, and bursts into the anterior chamber, this cavity may become completely filled with pus.

Treatment. — The remarks in last Section, on the treatment of onyx, apply, with little variation, to that of hypopium. The inflammation must be combated by the appropriate means, and in its subsidence we must chiefly trust for the removal of the purulent effusion. Bleeding, calomel with opium, and belladonna, will be necessary; and advantage may, in general, be reaped from the use of warm emollient fomentations, such as infusion of mallow leaves and flowers.

The giving exit to the matter of hypopium, by an incision of the cornea, is advisable, if the chambers appear filled; for we can never depend, in such a case, on absorption; while by delay we should risk the bursting and complete destruction of the eye. Under such circumstances, we must regard the opening of the cornea as nothing more than a means of freeing the patient from excessive pain, and of preserving such a form of the eyeball as may afterwards permit the application of an artificial eye.[1]

When the hypopium does not amount to such a quantity of matter as to fill the chambers of the eye, and especially when severe inflammation of the iris is present, opening the cornea might appear likely to aggravate the inflammation, increase the secretion of purulent matter, and expose the eye to protrusion of the iris. Notwithstanding these apparent objections, Mr. Wardrop has recommended evacuation of the aqueous humour, as a remedy of much service, in the early stages of hypopium; and in cases of iritis, and of ulcer of the cornea, combined with hypopium, we have the testimony of Dr. Monteath[2] in favour of still greater interference.

Dr. Monteath recommends an incision, two or three lines long, to be made with the iris-knife. This extent is necessary, from the purulent exudation being thick and adherent, so that it will not flow out, but requires to be extracted by forceps, or a small blunt hook. Dr. M. mentions, that, after opening the cornea, and laying hold of a small filament of the matter, he has often been able to extract the whole in a mass, which, examined through the cornea, had every appearance of pus; but, when extracted, was found in all respects similar to the exudation of puriform lymph, on the surface of an inflamed pleura or peritoneum. He observes, that when the hypopium is considerable, the operation, repeated again and again if necessary, checks the suppuration and ulceration of the internal surface of the cornea, which invariably take place when the collection mounts as high as the centre of the pupil, and which is so apt to end in bursting of the cornea and destruction of the eye.

In cases of hypopium, Mr. Guthrie follows a similar plan to that which he recommends in onyx; namely, a free division of the cornea, after which the eye is to be kept padded.

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[1] Bidloo, Exercitationum Anatomico-chirurgicarum decas; Exerc. vii. De Oculo Purulento; Lugduni Batavorum, 1704.

[2] Glasgow Medical Journal; Vol. ii. p. 122; Glasgow, 1829.

SECTION III. — ULCERS, FOSSULA, HERNIA, AND FISTULA OF THE CORNEA; AND HERNIA OF THE IRIS.

Fig. Wardrop, Pl. V. *figs.* 1, 2. Pl. X. *fig.* 1. Dalrymple, Pl. XIV. *figs.* 1, 2. Sichel, Pl. VII. *figs.* 2, 3.

1. There are two distinct varieties of ulcer of the cornea, the *superficial* and the *deep*.

The former generally extends over a considerable portion of the surface of the cornea, and often appears to involve little more than its epithelium or conjunctival covering. The deep ulcer is commonly much less extensive; but affects the proper substance of the cornea, and often penetrates completely through it, so as to open the anterior chamber, and give exit to the aqueous humour. The superficial ulcer sometimes arises from slight mechanical or chemical injuries. It occurs much more frequently in the catarrho-rheumatic than in any other of the ophthalmiæ. The deep ulcer of the cornea is generally the result of the bursting of a scrofulous phlyctenula, or the giving way of an onyx externally.

The superficial ulcer of the cornea discharges only a thin clear matter; its surface is slightly rough; its edges are, in general, very irregular, and so little raised above the level of the ulcer that, in many cases, the surface of the cornea appears merely as if abraded. Not unfrequently we may observe an ulcer of this kind spreading from day to day at one part of its edge, and cicatrizing at another part. The cicatrice which follows such an ulcer, is grayish or blueish-white, and semi-transparent. It eventually clears. Sometimes the appearance of the ulcer is as if a portion of the cornea had been sliced off. It may continue so for weeks or months, constituting what has been called an asthenic ulcer, or incorrectly, a transparent cicatrice; but at length, becoming covered by an opaque fibro-albuminous exudation, it undergoes a real process of cicatrisation.[1]

The deep ulcer is small and circular; and by penetrating the laminæ of the cornea one after the other, but the deep-seated laminæ less extensively than the superficial, comes to present a funnel-shape. Its surface is usually ragged, and covered with a sloughy-like matter, which assumes a white colour, if touched by any lotion or other preparation containing sugar of lead. The same happens to the superficial ulcer, which becomes covered by an opaque cicatrice, in consequence of the use of saturnine applications. Hence, in every case of ulcer of the cornea, these applications are totally inadmissible. The deep ulcer is apt to become covered with red vessels before it heals up, especially if it be the result of any chemical injury. Deep scrofulous ulcer is sometimes attended with onyx. I have also seen, in such cases, a deposition of puriform lymph into the anterior chamber, from the lining membrane of the cornea. (See Case 279.)

I have already (p. 437) had occasion to speak of troughing ulcer, as it has been termed, at the edge of the cornea, the consequence of chemosis in the puro-mucous ophthalmiæ. I may mention that I have occasionally met with an obstinate variety of ulcer, in the same situation, which, creeping slowly on, one portion of it sometimes cicatrizing while another was spreading, has at length formed a deep trench round a great part of the edge of the cornea. This variety of ulcer occurs in old subjects; is attended by severe pain in the branches of the fifth nerve round the orbit; and if it does not destroy vision by penetrating the cornea, is very apt to do so by exciting inflammation of the iris and closure of the pupil.

A deep ulcer, when healing, sometimes appears for a time as a transparent *fossula* in the cornea; but generally this fills up, and is converted into an opaque cicatrice, the centre of which may still be somewhat depressed, or be on a level with the surface of the cornea, or be slightly elevated. It presents a yellowish-white colour, while the circumference is more of a grayish-white. Such a cicatrice or leucoma seldom admits of being completely absorbed.

Solutions of saline substances to the eye, when the cornea is affected with ulceration, are exceedingly apt to cause an opaque cicatrice. The salts, such as nitrate of silver, acetate of lead, and the like, are decomposed by the tears and the mucus of the conjunctiva; and their bases being precipitated in an insoluble state on the ulcerated surface, become incorporated with the cicatrice. Such applications, therefore, should always be avoided as much as possible.

2. There is one peculiar appearance of the cornea, which must not be confounded with the ulcers above described; namely, that state of it which follows the absorption of a phlyctenula. The result of such absorption is a small *fossula*, still smoother and more transparent than the similar appearance which sometimes occurs in cases of deep ulcer, being, in fact, covered by the epithelium, which has fallen down into the little dimple formed by the removal of the contents of the phlyctenula.

3. Occasionally it happens, that the progress of a deep ulcer is arrested by the lining membrane of the cornea, or that this membrane, after having been penetrated by the ulcer, heals up; but in either case, being unable by itself to support the aqueous humour, it is protruded through the ulcer in the form of a vesicle, constituting what is termed *hernia of the cornea.* The patient whose eye is in this state, or presents a transparent dimple in the cornea, ought to guard against touching it roughly, and avoid all violent exertions. On blowing the nose, or straining at stool, the cornea is very apt to give way, with a sensation of a sort of snap in the eye, and a gush of water from it. A young lad had been under my care for gonorrhœal ophthalmia; he had a deep ulcer of the cornea; it healed, and left

a transparent dimple. About 12 months afterwards, on striking his eye suddenly with the thumb, the dimple gave way, and a myocephalon took place.

Protrusion of the lining membrane of the cornea sometimes takes place to a very great extent, assuming a conical form, and rising so far above the natural level of the cornea as with difficulty to be covered by the eyelids. In this case, we are obliged to remove it with the scissors, or destroy it by the application of lunar caustic; and what is very remarkable, such a protrusion is apt to return again and again, even in the course of a few days after we have completely removed the preceding one, till at length the cicatrized cornea attains a sufficient degree of firmness.

4. When an ulcer fairly penetrates the cornea, the aqueous humour is suddenly discharged, the iris falls forward, and but too often becoming engaged in the ulcer, protrudes through it, forming a small black point like the head of a fly, whence the name, *myocephalon*, which is bestowed on this *hernia of the iris.* The bit of iris which protrudes, speedily adheres to the edges of the ulcer, and as the inflammation subsides, contracts, and becomes covered by an opaque cicatrice. But should the inflammation of the eye increase after this accident, so that more of the cornea is destroyed, and more of the iris protruded, the latter, covered by a pseudo-cornea, is very apt to form a staphyloma.

5. Artificial wounds of the cornea, such as the section made for extraction of the cataract, sometimes remain long open, and threaten to become callous and fistulous. A perforating ulcer of the centre of the cornea may fall into a similar state, and allow the aqueous humour to drain away for a number of days. These may be considered as instances of *fistula of the cornea;* but the most remarkable affection of this sort occurs in the manner described at page 392.

Both kinds of ulcer of the cornea, but especially the deep, are usually attended by much intolerance of light, and a gush of burning tears on opening the eyelids.

The subjects of ulcer of the cornea, and especially of the deep ulcer, are rarely robust or in a good state of general health. On the contrary, they frequently present the indubitable signs of great weakness, sometimes even of inanition. In emaciated infants, particularly, I have repeatedly seen the cornea of one or both eyes become thin and prominent, and give way, without much, and even without any apparent inflammation. The wasted state of the body in such subjects arose from various causes, as chronic diarrhœa, cough following measles, hydrocephalus, and syphilis. In 1832, I saw several instances of the same destructive ulceration of the cornea, occurring after malignant cholera. I have sometimes been led to compare such eyes to those of the dogs in Magendie's experiments, which being fed, or rather starved, on white sugar and distilled water, died from exhaustion, their death being preceded by perforating ulcer of the cornea and evacuation of the humours.[2] A similar state of the cornea, along with anæsthesia of the eye, eyelids and face, sometimes arises from disease of the fifth nerve.

Treatment.—In all cases, we endeavour to check the ulcerative process, by the measures best fitted for subduing the particular ophthalmia in which the ulcer has taken its origin. The girl, whose case I have related at page 491, was in a state of great debility from over-depletion. Within 24 hours, tonic treatment arrested the progress of a deep ulcer on the cornea. In chronic superficial ulcer, which often proves very tedious, calomel, given so as to affect the mouth, is sometimes necessary. In almost all cases of ulcerated cornea, counter-irritation is useful. As the inflamed state of the eye abates, the patient finds the pain greatly relieved. We now observe the ulcer losing its purulent appearance and clearing, while its edges become smooth and begin to contract.

"Some chronic ulcers of the cornea will heal," observes Mr. Bowman, "in the most gradual manner, without the formation of any vessels in their vicinity;" but, "if any ulcer exists, having to heal by a slow and gradual process, we usually find, in the interval between it and the neighbouring vessels, a grayish half-transparent tract, distinguishable from the healthy cornea; and in this there is soon developed a series of vessels, which presently declare themselves as arteries, capillaries, and veins, carrying the blood in a circuit through and about the seat of reparative action. . . . . Thus is the cornea made dull and useless for a time, by the introduction of a structure destructive of its transparency, in order that its integrity may be restored according to the natural laws of growth. When its restoration is somewhat advanced, and less blood is required, these vessels dwindle; their coats, which are at best imperfectly organised, soon disappear, and the cornea becomes once more permeable to light."[3]

No remedy, in my experience, has proved more beneficial in ulcers of the cornea than belladonna. I do not at present refer to its dilatation of the pupil, although this effect is also of high importance, but to its anodyne effect on the eye, whereby a healing action appears to be induced in the ulcerated part, leading to its speedy cicatrisation. I regard it as an essential part of the treatment in all cases of deep, and even in the more serious cases of superficial, ulcer of the cornea, to employ extract of belladonna, or solution of atropine. If artificial dilatation of the pupil is neglected, the iris, even when the ulcer is yet far from penetrating into the anterior chamber, may advance into contact with the cornea, and become adherent. The good effects of belladonna in freeing the iris, even after it had become involved in an ulcer of the cornea, is well illustrated by the case of James Tassie, which I have related at page 492. I have repeatedly witnessed the same happy result, under similar circumstances.

It frequently happens, that the ulcer itself is a principal cause of prolonging the inflammation of the eye, while the flow of tears and the motions of the eyelids, constantly irritating the ulcer, keep it from healing. In such a case, there is one method of treatment eminently useful, and that is the coating of the ulcer in such a way that it shall, for a time at least, become insensible.[4] This is effected by the application of lunar caustic, in solution or in substance, which so coats the surface of the ulcer as to render it able, for a time, to withstand the friction of the eyelids and irritation of the tears. In the interval of rest, the healing process is allowed to go on; and before the thin slough is thrown off, which is formed by the application of the caustic, the ulcer has contracted. Were we to leave the case here, the ulcer would, in all likelihood, again spread, and might penetrate the cornea. As soon, then, as we observe a renewal of pain and lacrymation, and that the edges of the ulcer are again assuming a jagged and elevated appearance, the caustic should be re-applied.

In cases of superficial ulcer, the best mode of applying the caustic is to touch the diseased surface with a camel hair pencil, dipped in a solution of from 4 to 10 grains of the nitrate of silver in an ounce of distilled water.

The deep ulcer is better managed, in general, by sharpening a pencil of caustic, and touching the diseased surface with it for an instant. During this application, the upper lid is to be kept elevated; and before it is allowed to fall, a little water is to be dropped upon the cornea from a camel-hair pencil.

This use of caustic must be gone about cautiously, and had recourse to only when the ulcer betrays no disposition to heal under the influence of the remedies above recommended. Were it employed in every case of ulcer of the cornea, and in every stage, incalculable injury would no doubt often be done. Dr. Jacob has made an observation on the subject, worthy of consideration. Speaking of the application of the nitrate of silver to ulcers of the cornea, he says, "When applied to such ulcers, either in solution or substance, it either adheres to, or becomes entangled in, the flocculent surface; and if this surface be not a slough and completely cast off, the nitrate of silver, rendered black or brown by exposure, becomes permanently fixed as the ulcer heals, and constitutes an indelible dark speck."[5]

The caustic is to be applied in the way above described, if hernia of the cornea be present, or if the cornea be penetrated, and hernia of the iris has taken place. The extract of belladonna being painted on the eyelids and eyebrow, or the solution of atropine dropped on the conjunctiva, the pupil in the course of half an hour will probably be dilated, in cases where central perforation of the cornea has happened within a few hours; we then touch the ulcer with the caustic pencil, and continue the use of the belladonna or atropine. If the iris does not retire under the action of the belladonna, the application of the solid caustic arrests the prolapsus. Adhesion takes place between the edges of the ulcer and the iris; the tumour shrinks, and by and by is covered with a solid cicatrice. The caustic does not destroy the iris, but merely makes it contract. In fistula of the cornea also, after snipping off the projecting portion of conjunctiva, the opening is to be touched freely with the lunar caustic pencil. When a hernia of the cornea or of the iris projects much, it may also be removed with the scissors, and then the caustic applied. If the surface of the ulcer, or the piece of protruding substance, be just whitened by the action of the nitras argenti, it is, in general, enough. We ought never to continue the contact, so as to cause a slough of any considerable thickness.

When there is a deep ulcer over the pupil, it has been thought advisable to evacuate the aqueous humour, and to touch the ulcer with the solution of lunar caustic. In such cases, originating in traumatic or in scrofulous ophthalmia, I have found great advantage from puncturing the cornea near its edge. Dr. Monteath has recommended a somewhat different practice.

"A deep scrofulous ulcer of the cornea," says he, "nearly penetrating into the anterior chamber, at which stage there is almost always pretty acute inflammation, assuming the vascular character, is very apt to induce iritis, and secretion of pus into the anterior chamber, forming hypopion. This is a state of considerable danger to vision, particularly if the ulcer be nearly opposite to the pupil; but wherever it may be situated, I hardly ever fail to excite a healing action in the ulcer, and to give an immediate check to the hypopion and inflammation of the iris, by the following treatment. The first and most important step is, to perforate the remaining layer, or layers, of the cornea, at the bottom of the ulcer, with an iris-knife, and allow the aqueous humour to flow out, and the anterior chamber to collapse. The second, is to give a full dose of calomel and opium each night, till the mouth is, in the slightest degree, affected. The very first night after the puncture, the patient sleeps soundly, which he had been prevented from doing for several previous nights by violent supra-orbital and hemicranial pain. In a day or two after this trifling operation, the ulcer is completely filled with coagulable lymph, which even overlaps its border so as to put on the appearance, to an inexperienced surgeon, of the ulcer being much increased in size, whereas, it is the most favourable circumstance that could happen, because the redundant lymph is removed by absorption in a very few days. In proportion as the lymph, deposited in the ulcer, becomes organized, the integrity and natural size of the anterior chamber are restored. From the combined effects of the evacuation of the aqueous humour, and of the mercury, the iritis is rapidly removed, and the case now requires merely the ordinary treatment for scrofulous ophthalmia, attended with an ulcer on the cornea, which is one of the most common occurrences in ophthalmic practice."[6]

When we meet with an ulcer which has been touched with acetate of lead in solution, a remedy often recommended by ignorant people for inflamed eyes, we ought with the small silver spatula to endeavour to remove the white deposit adhering to the surface of the ulcer, lest it become indelibly incorporated with the cicatrice, forming a peculiar chalk-like speck, which may never afterwards be capable of being removed either by absorption or operation. This attempt, however, must be made with great caution, lest we cause a large opacity of a different character, viz., from additional loss of substance of the cornea.

Prognosis.—In all cases of deep ulcer, we ought to forewarn the patient of the opacity of the cicatrice, and the consequent deformity, and, it may be, abridgment, or even loss, of sight. Even when the ulcer is superficial, it is proper to pronounce a cautious prognosis; for, though the epithelium is commonly regenerated in such a way that the transparency of the cornea is not impaired, this is by no means always the case.

[1] Desmarres, Annales d'Oculistique; Tome ix. p. 98; Bruxelles, 1843.

[2] Mémoire sur les Propriétés nutritives des Substances qui ne contiennent pas d'Azote, p. 7; Paris, 1816. See Case of Ulcerated Cornea, from Inanition, by Joseph Brown, M.D., Edinburgh Journal of Medical Science; Vol. iii. p. 218; Edinburgh 1827: Cases from Acute Hydrocephalus and other causes, by Stöber, London Medical Gazette, July 7, 1843, p. 543.

[3] Lectures on the Parts concerned in the Operations on the Eye, p. 31; London, 1849.

[4] Scarpa, Trattato delle principali Malattie degli Occhi; Vol. i. p. 280; Pavia, 1846.

[5] Dublin Hospital Reports; Vol. v. p. 367: Dublin, 1830.

[6] Glasgow Medical Journal; Vol. ii. p. 133; Glasgow, 1829.

SECTION IV.—OPACITIES OR SPECKS OF THE CORNEA—NEBULA—ALBUGO—LEUCOMA.

Fig. Wardrop, Pl. II. *fig.* 3. Pl. VII. *figs.* 1–3. Dalrymple, Pl. II. *figs.* 5, 6. Pl. III. *fig.* 1. Pl. XIV. *figs.* 3, 5, 6. Pl. XV. *fig.* 1. Pl. XVI. *fig.* 1—6. Sichel, Pl. VII. *fig.* 4.

Opacities or specks of the cornea are distinguished by different names, according to the degree of density they present, and the manner in which they originate.

1. *Nebula* is the slightest degree. It resides most frequently in the superficial layers of the cornea; occasionally it has its seat in the lining membrane; rarely in the proper substance of the cornea. A general nebulous state of the cornea is supposed to be sometimes the consequence of pressure merely, from preternatural increase of the aqueous humour. In some cases, it appears to be the result of serous effusion into the substance of the cornea; in others, to arise from fibrine effused on the internal surface of its lining membrane, or deposited between its proper substance and either its lining membrane or its anterior elastic lamina. Nebula includes only those opacities of the cornea which are cloudy or hazy. In general, this kind of speck is also extensive and undefined, becoming less and less opaque towards its edges, and often affecting the whole cornea.

Nebula is a frequent consequence of puro-mucous ophthalmia, but its most common cause is scrofulous corneitis. The inflammation produced by inverted or supernumerary eyelashes, or inverted eyelids, and that arising from sarcomatous or granular conjunctiva, are also abundant sources of nebula. Depending on the latter causes, this opacity will require for its removal, the cure of the disease of the eyelid, and will not be at all benefited by any remedies directed against the state of the cornea merely. Whenever we find the upper half of the cornea nebulous, and especially nebulous and vascular, we may suspect the conjunctiva of the upper eyelid to be granular.

2. Whenever the effusion of lymph into any part of the cornea is so dense as to present a pearly appearance, the name of nebula is changed for that of *albugo*.

This sort of speck has most frequently its seat immediately under the anterior elastic lamina of the cornea. The lymph effused forms an opaque spot, generally circular or oval, more dense usually in the centre than towards the circumference, but in some rare cases presenting the appearance of a ring.

The common source of albugo is a phlyctenula on the cornea, which has receded without bursting. Like every other abscess, these minute ones may be regarded as cavities formed by the exudation of coagulable lymph, and containing pus. The sphere of lymph which surrounds the pus, appears to be formed for the purpose of limiting the extent of the disease. When the phlyctenula disappears without bursting, the contained matter being absorbed, the sphere of lymph remains for a time, or, it may be, forms a permanent speck.

Another occasion of albugo is when the pus of an onyx is either absorbed, or evacuated by the knife. Onyx or abscess of the cornea is always attended by more or less lymphatic effusion; and after the pus is dispersed, the laminæ of the cornea which were separated by its presence are re-united by a process of adhesion, which cannot be accomplished without a new secretion of lymph.

Albugo may sometimes be observed with numerous red vessels running into it from the conjunctiva, and is extremely apt, when this is the case, to spread, and to push across the cornea. This *vascular albugo* is occasionally very obstinate. It is always somewhat, and not unfrequently much and abruptly, elevated above the level of the cornea. The conjunctiva corneæ, under which the red vessels run, is much thickened. In some cases, these vessels are so numerous as to make the albugo appear red, with patches of white in the interstices. We meet with this variety of albugo in scrofulous adults, and sometimes in children. The shrinking and disappearance of the red vessels which feed it, afford ground to believe that the albugo will cease to spread; but it is rarely the case that the speck itself totally disappears. It is sometimes destroyed by spontaneous ulceration.

3. A third sort of speck is called *leucoma,* and is always the result of cicatrisation. A loss of substance in the cornea by ulceration, and a partial filling up of that loss by granulation, always precedes the formation of leucoma, which indeed is synonymous with opaque cicatrice. It is not a very uncommon occurrence for the epithelium covering a leucoma to be loose, from the interposition of a fluid between it and the proper substance of the cornea.

When the history of the case is unknown, it may not be possible to distinguish between an albugo and a leucoma. In general, leucoma has a contracted and circumscribed appearance; albugo one more diffused. Albugo is rarely, but leucoma often, depressed at its centre, and frequently combined with partial adhesion of the iris to the cornea.

Prognosis and treatment.—All the three kinds of speck, *nebula, albugo,* and *leucoma,* have a natural tendency to disperse, as soon as the disease which has given rise to them, subsides or is removed; and that whether they depend on primary inflammation spreading to the cornea, or secondary inflammation of that part, arising from the irritation of inverted eyelashes or granular conjunctiva. We must, then, in every case, endeavour to remove the ophthalmia, or the mechanical irritation on which the opacity depends, assured that if we succeed in this, nature, by the process of absorption, will sooner or later accomplish the whole amount of recovery which is possible. In children and young persons, many very dense and extensive opacities are removed in the natural progress of growth, which would be quite irremovable in adult life.

Demours[1] is of opinion that the cornea grows from its circumference; and relates, in support of this idea, the case of a child, who, at the age of six months, had an inflammation of the eye, followed by abscess of the cornea, evacuation of the aqueous humour and adhesion of the iris to the cornea, near its edge. At the age of eight years, this adhesion was at the distance of a line only from the centre of the cornea, whence it follows that the growth of the cornea had taken place between the adhesion and the edge of the sclerotica. (See case 169.)

Leucomata clear at the circumference, and shrink towards the centre. If a leucoma be attended with adhesion of the iris to the internal surface of the cornea, in proportion as the clearing of the circumferential portion of the cornea proceeds, the iris comes into view, lying in close contact with the cornea; and as the growth of the latter goes on from circumference to centre, the iris is apt to give way here and there, so that light penetrates through the torn places and reaches the interior of the eye, vision in some measure improving from this cause.

We are able, by various applications, to hasten the action of the absorbents in the removal of specks, especially if the applications in question be employed at the proper time. If we commence their use too soon, that is to say, before the cause of the opacity be subdued, we shall often, not merely torment the patient unnecessarily, but actually impede the cure. For instance, in a case of opacity, arising from scrofulous corneitis, and still attended by considerable vascularity, were the practitioner forthwith to attack the eye with stimulating powders, and solutions of irritating or caustic substances, not only would he fail in effecting his object, but, by exasperating the disease, run a great chance of rendering his patient blind. But if he began by combating the inflammation still lingering in the eye, and that chiefly by constitutional remedies, not merely would he witness the dispersion of the redness, but he would find the cornea begin to clear, and day after day a little more of the effused lymph being removed, the patient's vision would proportionably improve.

It may be remarked that, in general, the internal and constitutional remedies which do good in specks of the cornea, are those which operate in removing the ophthalmiæ in which the opacities have originated; and the same observation holds good in regard to the local remedies also. At the same time, there are both general and local means peculiarly adapted for hastening the absorption of opaque depositions in the cornea. The exhibition of an emetic every three or four days, and a gentle course of mercury, are general remedies of this kind. Some opacities yield, only under the influence of country air and generous diet.

Most of the applications used for dispersing opacities of the cornea, act simply as stimulants. Neither nitrate of silver, nor any of the innumerable substances, soluble and insoluble, applied for the cure of specks, act by causing any slough or destruction of the opaque substance, nor by eating it away, as the vulgar suppose; whether they act mechanically or chemically, or in any other way, they simply excite such irritation as causes the capillaries to become turgid, and as the increased vascularity subsides, such increased activity in the absorbents as serves to carry off the opaque matter deposited in the cornea.

One, however, of the means used for the cure of specks, may perhaps act differently; and that is, the vapour of hydrocyanic acid, on the supposed influences of which I may refer to what I have said at page 428. I have witnessed good effects from its use in many cases of speck, especially in nebula consequent to corneitis; in leucoma, combined with vesication of the cornea, or watery effusion under the epithelium; and in vascular albugo. In this last affection, the action of the vapour causes the vessels to shrink, after which the speck ulcerates and disappears.

When we find that the process of clearing has begun, we may often greatly assist it by such means as the following: — Vinum opii, pure or diluted; a solution of from 2 to 10 grains of lunar caustic, or from 1 to 2 grains of corrosive sublimate, in an ounce of distilled water; red precipitate salve, of various strengths; a finely levigated powder, consisting of from half a drachm to a drachm of red precipitate to an ounce of white sugar. The powder is to be blown into the eye with a quill; the salve is to be introduced behind the upper lid, and rubbed on the cornea by moving the lid with the finger in various directions; the fluids may either be dropped in by means of a camel-hair pencil, or injected over the surface of the eye with a syringe. One only of these applications is, in ordinary cases, used daily; but when the eye is less sensitive to stimulants than common, one of them may be applied in the morning and another at bedtime.

Besides the substances above enumerated, many others have been celebrated for removing specks; but in none of them is there any specific virtue. Mead recommended equal parts of pounded glass and white sugar-candy, levigated into an impalpable powder, which he thought wore off the speck by its inciding quality.[2] Solutions of sulphate of zinc, sulphate or ammoniaret of copper, carbonate of potass, or sulphate of cadmium; iodide of potassium, in solution, or in salve; creosote, the bile of various animals, especially of the gadus lota and motella fluviatilis, bears' grease, and the juice of the gryllus domesticus; walnut oil, and oil of lemon peel; have all had their advocates.

The solution of lunar caustic is regarded by many as specific for those specks which are removable by excited absorption, so that they keep this solution ready by them for all such cases. Dr. Ryan recommends[3] an ointment of 1 drachm of nitrate of silver to 1 ounce of axunge, as more efficacious and less painful than a ten-grains' solution. It will be found advantageous, however, to change the stimulant, after it has been continued for some time.

In all our endeavours to remove opacities of the cornea, it is necessary to bear in mind, that the points of importance are the period of the disease at which stimulants are likely to prove useful, and the regular and frequent employment of the stimulating substance or substances selected.

There are few cases of speck which are not benefited by counter-irritation behind the ear, or on the back of the neck, and by occasional scarification of the palpebral conjunctiva.

I have often found vascular albugo intractable, unless the vessels running into the speck were divided, and the gums affected by mercury. The best mode of dividing the fasciculus of vessels is to lay hold of a fold of the conjunctiva with a small pair of toothed forceps, and snip it through with the scissors. If the enlarged vessels have escaped division in this way, a small hook may now be easily introduced beneath them, so as to raise them within grasp of the scissors. In children, this plan is generally impracticable, on account of their resistance and the smallness of their palpebral aperture. Considerable bleeding follows the operation, and ought to be encouraged by warm fomentations. Besides the vapour of hydrocyanic acid, a strong salve of nitrate of silver, or of red precipitate, proves highly useful in vascular albugo.

Passing a cataract-knife through a leucoma, without dividing the whole thickness of the cornea, is a practice recommended by Dr. Holscher[4], as serving to excite absorption.

The vulgar have a notion that specks can be removed by operation, but by medical men this has generally been regarded as impossible. Mead, indeed, speaks[5] of paring specks every day with a knife; and Darwin[6] of trephining them; while Dieffenbach[7] has actually cut out a leucoma from the centre of the cornea, and brought the edges of the incision together with sutures. Notwithstanding these authorities, any attempt to operate on specks of the cornea has generally been deemed unsafe or impracticable, except when the opacity has been merely a crust of oxide or carbonate of lead deposited on the surface of an ulcer of the cornea, or an earthy deposit limited to its anterior elastic lamina. In consequence of a solution of acetas plumbi being employed as a collyrium, it sometimes happens that a whitish crust remains after the ulcer is cicatrized, which I have repeatedly succeeded in detaching with the sharp point of a probe, leaving the cornea beneath nebulous, but susceptible of clearing completely under the continued application of vinum opii. Two cases are related by Mr. Bowman, in which the equator of each cornea was covered by a band of brownish opacity, sufficient to hide the pupil from view. In one of the cases, the opacity was finely mottled over with dots. In both cases, the corneæ beyond the opaque transverse bands, were perfectly clear. The epithelium being detached, in the one case by Mr. Bowman, and in the other by Mr. Dixon, so as to expose the opaque film, this was then sliced or broken off in small flakes, exposing the clear cornea. The pain attending the operations was great, but the subsequent inflammation slight. The epithelium was regenerated without any return of opacity, and vision restored by the operations. On analysis, the film was found to consist of the same ingredients as ordinary bone; namely, phosphates of lime and magnesia, with a proportion of carbonate of lime.[8]

Attempts have been made by Rosas, Gulz, Malgaigne, and others, to dissect or shave off opacities of the cornea, which probably had their seat deeper than the anterior elastic lamina. M. Malgaigne was led to adopt this practice from having found, in numerous dissections, that specks of the cornea occupied in general only the superficial laminæ, and that in brutes nearly half the thickness of the cornea might be pared away, and yet a transparent cicatrice ensue. Before attempting an operation which must be attended with so much danger, as removing any considerable thickness of the cornea, the surgeon should assure himself that there is, for the case before him, no other method by which vision might be restored with less risk; for example, by dilating the pupil by belladonna, or by the formation of an artificial pupil; that there is no anterior synechia, of such extent as might frustrate the result of the operation; that the pupil is not closed; and that the retina is tolerably sound. If the whole cornea is affected with opacity, the removal of the external laminæ ought to be confined to a central portion, about the size of the pupil; and it may be well to commence the operation, by circumscribing the part to be removed, by a circular incision.

The instruments used on one occasion by Dr. Gulz, in excising the opaque layers of the cornea, were the cataract-knife, with double cutting-edge, of Rosas, and the pyramidal knife of Beer, together with a small toothed-forceps and a delicate pair of scissors. The manipulations consisted in repeated and progressive introduction of the knife, through and beneath the external layers, until the transparent part of the cornea was at length reached, and exposed to the extent of a line and a half in diameter. The after-treatment consisted in the application of plaisters over the eyelids, to prevent their motion; and the application of cold or iced water, to obviate excessive re-action.

In one of M. Malgaigne's successful cases, even the slope left by the removal of the opaque laminæ was ultimately obliterated; and more than two years after the operation, the cornea continued smooth and clear, and the vision such that the patient, a girl of 18, was engaged in needle-work from morning till night, without the eye seeming to suffer.[9]

In many cases of indelible opacities of the cornea, the simple plan of dropping upon the eye, every second day, the solution of sulphate of atropia, or a watery infusion of extract of belladonna, suffices, by dilating the pupil, to improve the vision so as to allow the patient to walk about, to pursue his ordinary business, or even to read. Under such circumstances, any such hazardous operation as excision of the opaque layers of the cornea, should never be attempted. It will often happen, on proceeding to such excision, that the whole thickness of the cornea will be found to be pervaded by the opaque deposition, so that the operation will require to be abandoned.

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[1] Traité des Maladies des Yeux; Tome i. p. 54; Paris, 1818.

[2] Medical Works of Richard Mead, M.D. p. 538; London, 1762.

[3] Transactions of the Association of Fellows and Licentiates of the King and Queen's College of Physicians in Ireland; Vol. iv. p. 257; Dublin, 1824.

[4] Revue Ophthalmologique de la Littérature Médicale de l'Année 1842, p. 163; Bruxelles, 1843.

[5] Op. cit. p. 539.

[6] Zoonomia; Vol. iii. p. 71; London, 1801.

[7] Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 177; Dresden, 1831.

[8] Lectures on the Parts concerned in the Operations on the Eye, p. 117; London, 1849.

[9] On excision of opaque layers of the cornea, consult Hamilton, London and Edinburgh Monthly Journal of Medical Science, March, 1844, p. 198: Ibid. July, 1844, p. 626: Annales d'Oculistique; Tome ix. pp. 95, 180; Bruxelles, 1843: Ibid. Tome xiii. p. 211; Bruxelles, 1845.

SECTION V. — PANNUS, OR VASCULO-NEBULOUS CORNEA.

Fig. Beer, Band I. Taf. III. *fig.* 3. Band II. Taf. IV. *fig.* 3. Wardrop, Pl. II. *fig.* 3. Pl. VII. *fig.* 1.

By pannus is understood a vascular state of the cornea, with thickening of its epithelium, the result of chronic inflammation.

There are three varieties of the disease: — The *first* is the consequence of corneitis, and to this the name *pannus,* from the cornea presenting absolutely an appearance like a piece of red cloth, is generally confined; the *second,* more frequently denominated *vasculo-nebulous cornea,* is the result of granular conjunctiva; the third, which is often combined with xeroma, arises from the irritation of inverted eyelashes or eyelids. The *first* variety is idiopathic; the *second* and *third* are entirely symptomatic. In the *first* variety, the internal surface of the eyelids is smooth and natural; in the *second,* rough and sarcomatous; in the *third,* the eyelids or the cilia, by their distortion, rub on the cornea.

The prolongation of blood-vessels over or into the cornea is always attended with molecular changes in its substance, and often with more or less effusion of lymph, so that its lustre is destroyed and it is rendered semi-opaque. In the *first* variety of pannus, the blood-vessels are derived from those of the sclerotica, as well as from those of the conjunctiva; in the *second* and *third* varieties, the conjunctiva is the chief source of the abnormal vascularity of the cornea. Although the vessels from the conjunctiva have much the appearance of being covered only by hypertrophied epithelium, it is most probable that they lie under the anterior elastic lamina. When the sclerotic or deep-seated conjunctival network is the source of the prolonged vessels, they evidently pass beneath this lamina, and often pervade the whole lamellated tissue of the cornea to such a degree as to render it almost impervious to light.

Mr. Bowman observes, that "the vessels are to be regarded as originally a result of diseased action, not as themselves the disease. They are developed," says he, "under the salutary or conservative law of the organism, to enable a part of feeble vitality to sustain a morbid action to which it has become subject, and under which its vitality would otherwise sink. It is true that their presence marks the existence of disease, and is to a certain degree an index of its extent; but we must be on our guard against imagining that it constitutes its essence. Unless the vessels had been developed, the diseased process would long ago have terminated by the total destruction of the tissue. ...We may even go further, and maintain that these adventitious vessels are necessary to a cure, and to their own removal. . . . For as the morbid products (including the vessels) laid down in the cornea, require for their existence a certain accession of new material, in the way of continuous nutrition, so they cannot be removed unless means are found for the absorption and removal of the old material of which they are composed, and these means are mainly the vascular channels." [1]

The *first* variety of pannus or vasculo-nebulous cornea is curable by the remedies for corneitis. The *second* yields only when a cure is effected of the granular conjunctiva, on which it depends. The *third* requires evulsion of the offending cilia, or a radical cure of the trichiasis or entropium whence it takes its rise.

In the second variety, and only in it, a plan of inoculating the conjunctiva with blenorrhœal fluid has been proposed, as I shall explain in the next Section.

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[1] Lectures on the Parts concerned in the Operations on the Eye, p. 32 ; London, 1849.

SECTION VI.—GRANULAR CONJUNCTIVA.

Syn.— Trachoma. Pladarotes. Aspritudo, *Celsus*. Scabrities oculorum, *Pliny*. Palpebrarum asperitudo, *Marcellus*. Hypertrophy of conjunctival villi.

Fig. Müller, Taf. I. II. Eble, Taf. III. Dalrymple, Pl. XI. *figs*. 5, 6. Sichel, Pl. II. *figs*. 3, 4. Pl. III. *figs*. 1, 3.

In treating of the puro-mucous ophthalmiæ, I have repeatedly had occasion to refer to a thickened, fleshy, and rough state of the lining membrane of the lids and especially of the upper lid, known by the name of *granular conjunctiva*[1], and which is so frequent and troublesome a sequela of those ophthalmiæ. At page 454, I have made some remarks on the sense in which the term *granular* is to be taken, and on the impropriety of calling the prominences of the conjunctiva which exist in this disease, *granulations*. The prominences in question are doubtless the villi or papillæ of the palpebral conjunctiva, along with its glandular elements, hypertrophied and altered by chronic inflammation. In the normal state, the villi are visible under the microscope, although the conjunctiva is not injected; in a well injected preparation, they are visible to the naked eye. They exist chiefly on that portion of the membrane which lines the tarsi[2]; while the muciparous glands are most abundant where the conjunctiva is about to be reflected from the eyelids to the eyeball. The prominences then, which constitute the disease now before us, appear to be in general nothing more than these, the natural structures of the muco-cutaneous membrane of the eye, enlarged from inflammation.

Symptoms. — The granular prominences vary in different cases. In some, they are exceedingly numerous, slightly raised above the level of the conjunctiva, and give to the inside of the lids an appearance somewhat like that of a piece of shagreen (*fig.* 60.); in others, the grains are comparatively few, but prominent, very vascular, soft, apt to bleed, and often as large as hemp-seeds. The seat of the granular degeneration is the internal surface of the tarsi, and chiefly of the upper tarsus. The rest of the conjunctiva may present a red and swollen appearance, but is not really granular. Very often there is a row of insulated pale and hard granules, at or beyond the posterior edge of the upper tarsus.

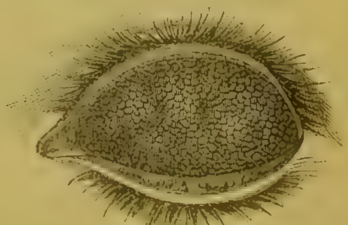

Fig. 60.

In the angle of reflection between the lower eyelid and the eyeball, we not unfrequently observe a row of bodies of a rounded form and somewhat vesicular appearance. These are different from enlarged papillæ, and consist, I presume, in the muciparous glands described by Krause[3], enlarged by chronic inflammation.[4]

I have already (p. 248) spoken of warts of the conjunctiva, which appear to arise from the irritation of a diseased secretion, resembling in this respect warts within the prepuce. They are altogether different from the prominences in granular conjunctiva; although, on examining the latter with the microscope, I have sometimes detected fungiform vegetations sprouting from their apices, and giving them a warty appearance. The common warts of the conjunctiva are very different; their exuberant growth and segregated disposition readily distinguishing them from granular conjunctiva. Besides, they spring from the ocular conjunctiva, the semilunar membrane, and the caruncula lacrymalis, much oftener than from the inside of the eyelids.

After granular conjunctiva has undergone treatment, the internal surface of the eyelid often presents hard irregular ridges and depressions, somewhat resembling cicatrices. This appearance is sometimes attributed to the action of the remedies employed for the cure of the granular conjunctiva. It seems to be the result of an atrophy of the papillary structure.[5]

The conjunctiva in the granular state secretes an inordinate quantity of mucus, which, on any additional irritation of the system, as from the use of spirituous liquors, or any local irritation, as from cold affecting the eyes, is apt to become again puriform. When this is the case, the contagious power of the original ophthalmia returns.

Rubbing against the cornea, the granular lids keep this part in a state of constant irritation, so that it becomes vascular and nebulous, particularly in its upper half. Should the case be neglected, great thickening of the epithelium of the cornea, with roughness and total opacity, may be the result. The cornea assumes somewhat of a greenish hue; viewed through a magnifying-glass, it is seen to be dotted over with minute depressions; and it is covered with prolongations of the blood-vessels emerging from the recti. Though the vasculo-nebulous state of the cornea is owing, in a great measure, to the granular condition of the eyelids, it would be erroneous to ascribe it entirely to this cause. It is, no doubt, partly an immediate result of the same inflammation, which has ended in hypertrophy of the papillæ of the palpebral conjunctiva. From time to time small phlyctenulæ form on the upper half of the cornea, break, and leave little pits or ulcers, thus adding to the irritation which attends the disease, as well as in causing opacity of the cornea.

Along with granular conjunctiva, the constitution scarcely ever fails to become affected, the patient suffering from hectic fever, with paleness, emaciation, and almost a scorbutic state of the system. The frequent febrile attacks are always followed by increased redness, swelling, and roughness of the conjunctiva. Under such circumstances, it is vain to attempt the cure of the local affection, unless the constitutional ailment is removed. When it is found impossible to effect this, the patient is apt to fall into phthisis pulmonalis.

Causes.—Granular conjunctiva may result from any of the puro-mucous ophthalmiæ. It is by no means peculiar to the contagious inflammations of the conjunctiva, but often arises from the mere catarrhal. A question of some importance is, whether this affection is a result simply of the puro-mucous inflammations of the conjunctiva, of these diseases being neglected, or of improper applications being made to the eye in these and in other ophthalmiæ. Mr. Lawrence[6] inclines much to the last view. He describes granular conjunctiva as the effect of strong applications of nitrate of silver, in salve or in solution, and says it "almost deserves to be named, from its exciting cause, lunar caustic ophthalmia." An ophthalmia may no doubt be produced by such applications, and end in granular conjunctiva; but I believe neglect of proper treatment, and especially of depletion, general and local, in the early stage of the puro-mucous ophthalmiæ, is the most frequent cause of this affection. We see it arise from catarrhal ophthalmia, where no application of any sort has been made to the conjunctiva.

Prognosis. — Although by sufficient clothing, proper diet, restriction from intemperance, good air, and judicious medical treatment, the sarcomatous state of the lids and opacity of the cornea, may, in general, be lessened or removed, and vision restored; yet, if the patient be of intemperate habits, be ill-fed, or be insufficiently protected from cold winds or damp cold weather, relapses will almost certainly take place, attended by renewed inflammation of the conjunctiva and puriform discharge, so that at last, especially in scrofulous subjects, the disease may prove incurable. Attempts to hurry the cure, by the too liberal use of local means, often throw the disease back, and bring on phlyctenulæ on the cornea.

Treatment. — 1. *Local depletion.* If the conjunctiva is very vascular and sarcomatous, a few leeches are, from time to time, to be applied to the external surface of the eyelids, or over the nasal vein. Advantage is also obtained from everting first the lower eyelid, and then the upper, and scarifying the conjunctiva in the manner directed at page 424. If the membrane generally is not much thickened, each granular prominence ought to be divided by a crucial incision, or the membrane cross-hatched by slight touches of the lancet.

2. *Astringents.* Many different substances of this class, the local action of which on the animal tissues depends on their affinity for albumen and fibrin, have been employed in the treatment of granular conjunctiva, the chief being alum, borax, sulphate of zinc, and acetate of lead.

Mr. Lawrence recommends[7] the liquor aluminis compositus, which at first is to be used in a diluted state. Each fluid ounce of this preparation contains about eight grains of alum, and as many of sulphate of zinc. The method of applying this and similar astringents in the fluid form, is to pencil them on the diseased membrane with a camel hair brush.

M. Chassignac uses a crayon of borax or sulphate of zinc. The borax he employs in its native state, only cut into the form of a cylinder. As it is but little soluble, he leaves it in contact with the conjunctiva for a few moments, and it has the effect of slightly whitening the surface without producing any scar. Sulphate of zinc he employs also in the form of a crayon, but mixed with variable proportions of powdered gum arabic. A paste being made of the two substances, it is rolled into the shape of a crayon, to be applied in the same way as the borax.[8]

Mr. Tyrrell and others have chiefly used the undiluted liquor diacitatis plumbi; a solution consisting of one part of water to 1·5 of the crystalised salt.[9]

M. Buys introduced the neutral acetate or sugar of lead, in the state of an impalpable powder, which he applied over the diseased surface with a miniature pencil, and allowed to dissolve in the tears. The immediate effect is to cause strong contraction of the diseased tissue; the granular prominences shrink; and the membrane appears smooth and uniform. After replacing the eyelid, the salt assumes a white shining appearance, and it is often a very long time before it becomes detached. It is to be applied at intervals of five or six days, till the cure is accomplished. It is stated, that in this mode of treating granular conjunctiva no insoluble precipitation is met with, even in cases where ulcers exist on the cornea[10], which is scarcely credible.

3. *Escharotics.* The escharotics most frequently used, have been nitrate of silver and sulphate of copper. A day or two after leeching or scarification, the lids being everted, and dried from the gleety mucus with which they may be covered, the lunar caustic pencil is to be brought into a single rapid contact with the granular prominences. Before allowing the lids to be replaced, a little warm water is to be squirted over the surface which has been touched with the caustic.

It is advantageous, after a time, to change the lunar caustic for the sulphate of copper, which may be more liberally applied to the diseased surface, and a smooth wedge of it pushed up occasionally behind the everted tarsus into the upper sinus of the conjunctiva.

Alternately, every two or three days, local depletion and one or other of the escharotics is to be employed, while warm fomentations, as the bichloride of mercury collyrium, are to be used thrice daily, and the red precipitate, or diluted citrine, ointment applied to the edges of the eyelids at bedtime.

Besides lunar caustic and sulphate of copper, in the solid state, the application of these substances, and of other escharotics and stimulants to the granular surface, in solution, or in ointment, is useful; and especially, red precipitate salve, and vinum opii. These assist in clearing the cornea, as well as repressing the sarcomatous state of the conjunctiva. A popular remedy which I have known do good, is the expressed juice of the holcus avenaceus.

4. *Counter-irritation.* During the employment of the other means of cure, advantage is derived from blisters kept open behind the ears, or on the nape of the neck.

Under this head, may be mentioned the plan of pencilling the external surface of the lids every five or six days, with solid lunar caustic.

5. *Sorbefacients.* Much advantage is obtained in many cases of granular conjunctivā, by putting the patient on the internal use of iodide of potassium.

Rubbing the external surface of the lids, for some minutes night and morning, with mercurial ointment, or with red precipitate salve, is found useful, in reducing the hypertrophy of the diseased tissue.

6. *Tonics.* The cure is greatly promoted by attention to the dietetical adjuvants mentioned under the head of the prognosis, and by the administration of tonics, especially chalybeates and the sulphate of quina. Soldiers, after being discharged from the army, are often cured of granular conjunctiva, in consequence of their going into the country, and there continuing the very same plan of treatment which had proved unsuccessful in a military hospital.

7. *Excision.* When granular conjunctiva has proceeded to a great degree of exuberance, and continued for perhaps many months, notwithstanding a careful trial of other plans of treatment, recourse may be had to a more speedy method of removal, namely by the knife.[1] The eyelid to be operated on is to be everted as completely as possible, and the hypertrophied papillæ, at least the most prominent of them, shaved off by means of a small and very sharp lancet-shaped knife, or dissected away with the scissors.

In performing the operation, it is necessary to beware of removing more than the mere granular layer. If more than this is taken away, hard and irregular cicatrices are left on the internal surface of the lids, the effects of which on the corneæ may be scarcely, if at all, less prejudicial than those of the morbid structure which has been removed.

8. *Inoculation.* The idea of curing granular conjunctiva, by exciting in the diseased membrane the inflammatory action of an acute attack of purulent ophthalmia, to be treated by venesection and other remedies, was first suggested by my friend, the late Dr. Henry Walker.[2]

The method of exciting such an inflammation, adopted by Professor Jäger and Dr. Piringer, is to inoculate the conjunctiva with matter taken from the eye of a child affected with mild ophthalmia neonatorum. The matter is applied to the inside of the lids, with a miniature pencil, and in a few hours produces its effect. The inflammation thus excited is to be treated like an ordinary attack of purulent conjunctivitis; and although the practice does by no means appear a very safe one, it is undeniable, that cures have in this way been effected, of the hypertrophied state of the conjunctiva, with the vasculo-nebulous condition of the cornea depending on it. For a full account of this practice, I refer the reader to a paper by Dr. Hamilton, in the "London and Edinburgh Monthly Journal of Medical Science" for July, 1843. I shall only add, that there are important contra-indications to the practice; one of which is the existence of scrofula, rheumatism, or any other dyscrasia.

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[1] "Hic affectus etiam *sycosis* seu *palpebra ficosa* dicitur, quia interna palpebræ superficies ficus discissi ad instar granulosa evadit." Plenck, De Morbis Oculorum, p. 30; Viennæ, 1777.

[2] Soemmerring's Abbildungen des

menschlichen Auges; Tab. ii. fig. 14; Frankfurt am Main, 1801.

[3] Encyclopédie Anatomique; Tome v. p. 585; Paris, 1845.

[4] See Eble über den Bau und die Krankheiten der Bindehaut des Auges, Taf. 3. fig. 13, Wien, 1828.

[5] On the pathological anatomy of granular conjunctiva, consult Thiry, Annales d'Oculistique, Tome xxi. p. 108; Bruxelles, 1849: Hairion, Ib. Tome xxiii. p. 109: Arlt, Ib. Tome xxiv. p. 231; Bruxelles, 1850.

[6] London Medical Gazette, July 11, 1845, p. 444.

[7] Ib. p. 446.

[8] Lancet, June 7, 1845, p. 654.

[9] Practical Work on the Diseases of the Eye; Vol. i. p. 134; London, 1840.

[10] Annales d'Oculistique; Tome xxi. p. 293.

[11] Sir William Read's Short but Exact Account of all the Diseases incident to the Eyes, p. 96; London, 1706.

[12] Edinburgh Medical and Surgical Journal, January 1811, p. 1.

SECTION VII. — CONJUNCTIVAL XEROMA OR XEROPHTHALMIA.[1]

Syn. — Xerosis conjunctivæ. Cuticular conjunctiva. Ueberhäutung der Conjunctiva, *Ger.* Atrophy of Conjunctiva. Symblepharon posterius, *Ammon.*

Fig. Ammon, Thl. I. Taf. I. *figs.* 16, 18—21.

Case 303. — Agnes Mackinnon, aged 26, applied at the Glasgow Eye Infirmary on the 26th March, 1833, under the following circumstances: —

The conjunctiva of both eyes was red, and had evidently suffered from long-continued inflammation. The right conjunctiva especially was of a dark red colour, and, where it passed from the lower eyelid to the eyeball, of an olive hue, from the frequent use of nitrate of silver solution.

The left conjunctiva had the appearance as if it were skinned over, being in many places of a whitish colour, and on the inside of the upper lid looking as if it had suffered cicatrisation. It was altogether drier than natural, and seemed almost destitute of its proper mucous secretion. The patient said that this eye watered much less than the right. At the nasal extremity of the left lower lid, there was a tendency to symblepharon; the conjunctiva, when the patient turned the eye upwards and outwards, forming a frenum which prevented the free motion of the eye. There was a slight inversion of the left eyelids, with some inverted eyelashes rubbing on the surface of the eyeball. Numerous red vessels were observed winding over the left cornea.

She said she had been subject to attacks of ophthalmia for eight years; the first attack being in the left eye, in consequence of a stroke with a shuttle. The conjunctivæ were never scarified, nor rubbed with solid caustic; and she never had any operation performed for the inverted state of the lids, except evulsion of the faulty eyelashes.

The inverted eyelashes were removed, and she was ordered to bathe the eyes thrice a-day with a tepid solution of 10 grains of muriate of ammonia and 20 grains of gum arabic, in 8 ounces of water.

The above is an example of an atrophic state of the conjunctiva, the result of long-continued and ill-treated inflammation of that membrane. It has been described by Mr. Travers, under the name of *cuticular conjunctiva.* He mentions[2], that he had seen cases of this conversion of the conjunctiva into a rugous and opaque skin, go the length of knitting the lids close to the globe and obliterating the palpebral sinuses. While he places it among the sequelæ of chronic inflammation of the conjunctiva, he considers it as immediately depending on an obliteration of the lachrymal ducts; a view of the subject perviously taken by Schmidt, who describes[3] the disease under the name of *xerophthalmos.*

A more complete account of this diseased state of the conjunctiva, we owe to Dr. Ammon, of Dresden. He acknowledges that the first case which he had an opportunity of examining, was pointed out to his attention by Professor Jäger, of Erlangen; who, in one of his clinical reports, had spoken of the affection under the name of *Ueberhäutung der Conjunctiva.*

The principal symptoms of conjunctival xeroma may be gathered from the case of Mackinnon, as above related. I may add, however, a few remarks, embodying what seems most interesting in Dr. Ammon's paper.[4]

Symptoms.—Although, in general, the conjunctiva presents a dark red colour, and has a thickened, rugous, and dusky appearance, it is sometimes whiter, and less vascular than natural. Even in the cases in which it is red, it bleeds much less than its colour might seem to promise, if we divide it with the lancet, with the view of taking away blood. It is always drier than in the healthy state, and looks as if it were skinned over. The caruncula lacrymalis has a dry, smooth, flat appearance; is sometimes whiter than natural; and is often so much shrunk as to be scarcely recognisable. In some instances, however, I have seen the caruncula hypertrophied, and secreting purulent flakes, which lay in the lower sinus of the conjunctiva. The puncta are generally contracted, or closed; sometimes, however, dilated and paralised. The cornea is dull and nebulous, with red vessels running over it. The eyelashes are few and dwarfish, and there is generally some degree of trichiasis or of entropium. Not unfrequently the conjunctiva is observed to fall into folds, around and especially above the cornea. The conjunctiva often presents frena, which bind the lids unnaturally to the eyeball, and the fissura palpebrarum is shortened. In a more advanced stage, the conjunctiva is greatly contracted, so that its sinuses are nearly obliterated, and the membrane is continued almost directly from the margin of the lids over the surface of the eye. This state has been called by Ammon *Symblepharon posterius.*[5] If the conjunctiva is touched with the finger, it betrays scarcely any sensibility. The Meibomian secretion is less than natural, or altogether wanting. The lids move incompletely, and with pain. The patient finds it difficult to open the eye, and complains of its feeling dry and gritty. If he is excited to weep, no tears flow, but the eye becomes red and painful, while no such effect is produced in the sound eye. The sight is weak; but becomes somewhat stronger and clearer, if the patient wets his eye with saliva, or anoints it with a little oil or lard.

Causes. — We generally find, that long-continued inflammation of the conjunctiva has preceded conjunctival xeroma. When sudden, it arises plainly from the action of escharotic substances on the conjunctiva, such as quicklime. Whether the cause acts suddenly or slowly, it seems indubitable, both from the aspect of the membrane and the other symptoms, that the structure of the conjunctiva is so altered, that its power of secreting epithelium or mucus is partially or entirely lost. The kind of inflammation most apt to lead to this change, is the scrofulo-catarrhal; but it may also follow any chronic conjunctivitis, scrofulous, catarrhal, or contagious. Dr. Ammon suggests, that granular conjunctiva subsiding, the membrane is disposed to fall into xeroma. The one is an hypertrophy, the other an atrophy, of the mucous tissue. I am inclined to think, that the most frequent origin of the disease is either a totally neglected scrofulo-catarrhal ophthalmia, or one treated only with stimulants, such as red precipitate salve, nitrate of silver salve, and the like. Instead of abating the conjunctival inflammations by proper soothing and emollient applications, and by the local detraction of blood, it has unfortunately become a too common practice to use only stimulants and escharotics, and some of these so strong that they probably destroy the mucous texture of the membrane to which they are applied; an effect followed, after some time, by the conversion of the conjunctiva into a mere cuticular covering. Saturnine applications are, probably, in many cases, the cause of xeroma; for if the least excoriation exists on the conjunctiva, the lead, precipitated by the muriatic acid which exists in the tears and conjunctival mucus, instantly fixes on the excoriated spot, renders it white and dry, and continues long or permanently adherent to it. Not unfrequently, we observe, in xeroma, numerous opaque spots on the cornea, apparently depositions of lime or lead.

I do not deny, however, that inflammation alone may destroy the power of the conjunctiva to secrete its natural epithelium. We see the mucous membrane of the tongue partially changed in a similar way, independently of any astringent or escharotic applications, so that it presents numerous white, skinny, unalterable patches.

Dr. Ammon, finding xeroma often attended by entropium, has come to the conclusion that the operation of removing a fold of skin for the cure of the latter, may often be the cause of the former, the excision being made too deep, and the consequent inflammation extending to the lacrymal ducts. But it is a sufficient answer to this notion, that we meet (as in Mackinnon) with this disease of the conjunctiva in subjects who have never undergone any such operation, and even in some who have had no inversion of the eyelids. That the lacrymal ducts are sometimes closed in xeroma, I do not mean to deny; on the contrary, I think there is good ground for believing that lacrymal and conjunctival xeroma are often conjoined: but may not the same chronic mismanaged inflammation, or the same violent escharotic applications which destroy the secreting pores of the conjunctiva, close also the mouths of the lacrymal ducts? Would mere closure of these ducts, with an otherwise healthy conjunctiva, give rise to the disease now under our consideration? I believe not; and Dr. Ammon seems inclined to the same opinion. It is the mucus of the conjunctiva, and not the tears, which, under ordinary circumstances, keeps the eye moist and the cornea pellucid. The moisture of the eye and the clearness of the cornea are preserved, even after the lacrymal gland is extirpated. But let the conjunctiva be deprived of its secreting faculty, not merely does the patient complain of a feeling of dryness in the eye, and move it with difficulty; but the membrane looks like the skin on the back of the hand; and the cornea, no longer guarded against the effects of air, dust, and light, becomes opaque. In one case which fell under my observation, the epithelium of the cornea presented an appearance as if it had been a piece of silk paper laid on the surface of the eye.

Prognosis.—The prognosis in conjunctival xeroma is bad. If the disease is not checked, blindness will be the result, from the cornea becoming dry and opaque.

Treatment.—Dr. Ammon found cold applications hurtful in this disease. Tepid ones should be used, and ought to bear some resemblance, in physical and chemical properties, to the secretion which the eye has lost, and which there is little hope of its recovering. The patient sees better when the surface of the cornea is moistened with some such collyrium as that recommended (page 85.) for lacrymal xeroma. Mr. Cadenhead, of Aberdeen, communicated to me a case of xeroma, in which the corneæ appeared dry, shrunk, and opaque, till a little prepared lard was daily applied to the eyes, on which they regained their transparency so much as to enable the patient to wander through the town, to examine small objects which might be met with in shop-windows, and even to read large print. Mr. Taylor, of London, has recommended[6] glycerine for the same purpose, frequently employed through the course of the day; it both serves to restore a degree of transparency to the cornea, and relieves the distressing sensations of heat and dryness. If the conjunctiva be very red, local blood-letting will afford considerable relief. The general health is carefully to be attended to; not neglecting the trichiasis, entropium, and other occasional local attendants on this affection of the conjunctiva. Any small portion of the conjunctiva bulbi, falling into a fold as the eye is moved, and causing irritation, may with propriety be snipped away. Dividing the conjunctival frena is of no use.

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[1] For Lacrymal Xeroma or Xerophthalmia, see page 84.

[2] Synopsis of the Diseases of the Eye, p. 120; London, 1820.

[3] Ueber die Krankheiten des Thränenorgans, p. 55; Wien, 1803.

[4] Zeitschrift für die Ophthalmologie; Vol. i. p. 65; Dresden, 1830; Vol ii. pp. 381, 412; Dresden, 1932.

[5] Ib.; Vol. iii. Taf. iv. fig. 4; Dresden, 1833.

[6] Edinburgh Medical and Surgical Journal; Vol. lxxxi. p. 33; Edinburgh, 1854.

SECTION VIII.—ANCHYLOBLEPHARON AND SYMBLEPHARON.

Fig. Ammon, Thl. II. Taf. VI. *figs.* 1—14. Walton, *figs.* 15, 13, 14.

A union of the edges of the eyelids, *anchyloblepharon*, and a union of the eyelids to the globe of the eye, *symblepharon*, are two diseased states which occur separately or together.

The edges of the lids may unite in their whole length, or only in part of their extent, and that generally at their temporal extremity. It is rarely the case that there is not an opening left at their nasal angle. Symblepharon may also be complete or incomplete; the front of the eyeball being united with the whole of one or of both eyelids, or a similar connection existing only in a small extent. These modifications have considerable influence upon the prognosis and method of cure; less, however, than the following. In some cases, the injured edges of the eyelids, or the surfaces of the eyeball and eyelids in a partially ulcerated or sloughy state, being left in apposition, a firm and unyielding cicatrice joins together the structures which were formerly free. In other cases, the injury being more superficial, coagulable lymph is effused between the two edges or two surfaces, and, becoming organised, forms the morbid connection. When the lids are united in such a manner, a whitish, uninterrupted, firm membrane obliterates their natural opening; and when the eyeball is adherent to one or both lids in this way, the organised coagulable lymph presents itself in bands of almost tendinous texture, stretching from the one surface to the other (*fig.* 61.). Sometimes there is only one insulated band of adhesion, behind which the probe may be passed. These bands may be compared, in some respects, to the partial adhesions so frequently met with between the pleura which covers the lungs and that which lines the chest; but in one respect they are essentially different; namely, that as the pleura is a serous membrane, adhesions in the thorax may take place even upon slight inflammation, whereas the conjunctiva, following the laws to which all mucous membranes are subject, never adheres in the manner described, so long as it continues entire. Were mucous membranes subject to the same conditions as serous membranes in this respect, the dangers to which life is exposed would be greatly increased, as adhesions between the opposite sides of all the hollow viscera would be continually taking place. Nature has therefore provided that no mucous membrane can become adherent, so long as its surface continues entire; and accordingly we find that, till it is wounded, or becomes excoriated, ulcerated, or partially destroyed by sloughing, the eyeball never contracts adhesions to the eyelids. I have seen few cases of symblepharon in which the cornea was not more or less involved. It is the lower half of the cornea which is most apt to suffer. In a case which came under my care, an upper segment of each cornea remained free and transparent, more than the lower half of each being incorporated with the lower eyelid, in consequence of a burn. The pupils being obliterated, I formed an artificial pupil in each eye, by separating the iris from the choroid, behind the upper portion of the cornea.

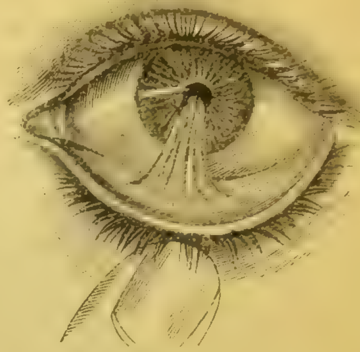

Fig. 61.

Causes.—Anchyloblepharon and symblepharon are chiefly owing to such traumatic inflammations as arise from burns, or from the influence of such substances as produce an escharotic effect; although any ophthalmia, productive of excoriation or ulceration, may give rise to these consequences. They occur most frequently in those whose eyes have been injured, and partial sloughing produced, by hot pieces of metal, boiling fluids, concentrated acids, or quicklime. Wounds penetrating through one or other of the eyelids into the eyeball are apt to give rise to partial symblepharon.

Case 304. — I saw a lad at the Glasgow Eye Infirmary, whose left eye, along with the edges of the left eyelids, had sloughed in consequence of a burn from melted iron, a piece of which, when he applied at the infirmary, was found moulded in the lower fold of the conjunctiva. The destruction of the eyeball, and partially of the eyelids, was followed by symblepharon, and almost complete anchyloblepharon, the only part of the eyelids which was open, being at the temporal angle, where, through an interstice about a line long, the tears distilled.

Prognosis.—The prognosis is various, and depends upon the possibility of completely separating the morbid adhesions, the chance of preventing them from returning, and the apparent or presumed state of the cornea.

The operation for anchyloblepharon can be performed with a reasonable hope of success only when it is not complicated with symblepharon; or if the latter be present, when it is inconsiderable in extent, and does not involve the cornea. There are various means of ascertaining the facts. One is, to take hold of a fold of the upper eyelid, and drawing it from the eyeball, desire the patient to move the eye as much as he can from side to side, and as if he were opening and shutting his eyes. By this means we are likely, not merely to discover the existence, but to ascertain pretty correctly the extent, of any adhesion between the eyeball and eyelids. A second means is the introduction of a small probe at the nasal angle of the lids. If there be no symblepharon, the probe passes on with ease to the temporal angle; whereas, when adhesion exists, the opposition to the point of the instrument informs us of the situation and extent of the morbid connection. A good deal may be ascertained, also, by observing the degree of sensibility to light which remains. If the patient with anchyloblepharon be able to distinguish various gradations of light, it is probable that no morbid adhesion involves the cornea, and that this part remains transparent. If he distinguishes only the more considerable changes of light, while the slighter gradations escape him, we must operate in a degree of uncertainty regarding the state of the cornea. It may not be adherent, but is, perhaps, in some measure opaque. If there is no sensibility to light, we may conclude, either that the adhesion extends to the whole surface of the cornea, and probably includes even a considerable portion more of the surface of the eyeball, or at least that the cornea, by the same inflammation which produced the anchyloblepharon, has been rendered completely opaque; and that therefore the great object of an operation, namely, the restoration of sight, cannot be obtained.

We will, of course, recommend the patient to undergo an operation when the case appears to be a simple anchyloblepharon, and we judge that the surface of the eyeball has either not suffered at all, or has suffered but little from the inflammation in which the anchyloblepharon has originated. On the contrary, when the sensibility to light is extremely indistinct or altogether wanting, or even though the sensibility to light be considerable, if the eyeball feels to the finger, through the eyelid, larger or smaller, harder or softer, than natural, or quite irregular on its surface, we will be cautious in recommending any operation, as the patient would thank us but little if we merely brought into view a useless and destroyed eye, which had formerly been concealed.

There is one reason, however, which may sometimes lead us to operate for symblepharon, altogether independently of any hope of restoring sight. If the one eye is sound and the other affected with this morbid union, the patient, on attempting to look from side to side, experiences a feeling of dragging in the eye affected with symblepharon, which restrains, in some measure, the exercise even of the sound eye. To relieve this, and with no view of restoring the sight, I have been solicited to separate the eyeball from morbid connections with the eyelids.

When the vision of the eye affected with symblepharon is good, the patient is apt to complain of diplopia, when he turns the eye so that he puts the adhesion on the stretch; and on this account he is sometimes desirous of submitting to an operation.

We sometimes meet with symblepharon combined with staphyloma; and here we are obliged to operate without any reference to restoration of vision, which in such circumstances is out of the question. The lids, bound down to the cornea, resist the growing staphyloma, and thereby cause a great degree of pain, which we relieve for a time by puncturing any part of the eye which is in view; but the puncture soon closes, the staphyloma again presses against the lids, the pain and fever return, and to give permanent relief we are forced, first, to operate for the symblepharon, and then immediately to remove the staphyloma. It would appear that, in cases of this kind, a fistulous communication sometimes forms between the staphyloma and the areolar tissue of the upper eyelid, so that, from time to time, the eyelid becomes greatly distended and the whole organ painful. On puncturing the swelling, a large quantity of what seems aqueous humour is discharged. This relieves the patient till the fluid again accumulates; but permanent relief can be obtained only by exposing the front of the eye, and excising it. In cases like this, it is sometimes doubtful whether the fluid accumulated in the upper eyelid, is not derived rather from the lacrymal gland than from the interior of the eye, the symblepharon preventing the tears from escaping.

Treatment.—1. The operation for *anchyloblepharon* requires to be performed somewhat differently, according as the eyelids are united immediately or through the medium of a pseudo-membrane. If they are united immediately, and there is no sufficient aperture at their nasal extremity for introducing a small grooved director, the assistant takes hold of the upper lid between his finger and thumb, so as to form a vertical fold, which he raises as much as possible from the eyeball, while the operator, with his left hand, does the same to the lower lid. With a scalpel the operator now divides the fold which is thus formed, by a transverse incision to the extent of 2 or 3 lines, exactly in the course of the natural opening of the lids. Through the incision thus made, the director being passed and run along to the inner angle of the lids, the nasal portion of the anchyloblepharon is to be divided on the director, which is then to be shifted so as to allow the temporal portion to be treated in the same way. After the central opening is made in the manner described, the rest of the operation may be performed with scissors. If the lids present a considerable opening at their inner angle, the director is at once introduced through this, and the anchyloblepharon divided.

When the edges of the lids are united by a pseudo-membrane, we perform, first of all, an operation similar to the above, only that we make the incision close to the edge of the lower eyelid, leaving the whole of the pseudo-membrane attached to the upper; then, laying hold of the membrane with forceps, we remove it with the scissors.

The success of the operation depends upon our preventing re-union of the separated lids, or in other words, upon their edges becoming quickly skinned over. To secure this, Mr. Walton suggests[1], that the surfaces, being well dried, should be touched with collodion.

Dr. Schindler relates[2] a case which he cured by embracing the anchyloblepharon in two ligatures, which made their way through by the third day.

2. When a case of *symblepharon* presents itself uncomplicated with anchyloblepharon, it is not difficult to determine whether we can undertake an operation with hopes of success. We see distinctly in what condition the cornea is, and can judge what are likely to be the effects of dividing the morbid adhesions. When the symblepharon is insulated, so that we can pass a probe round it, a cure is always accomplished by operation. When the adhesion is continued back to the angle of reflection of the conjunctiva, the result of an operation is uncertain. When the adhesion is very extensive, interference is useless.

Considerable as is the liability of anchyloblepharon to recur after operation, here it seems impossible to prevent, at least to a certain extent, the gradual re-adherence of the divided parts. We need not expect, therefore, to perform the operation, without the re-appearance of some bands of adhesion, which will require to be removed by a second operation, except where the symblepharon is a mere insulated tag. When this is the case, the adhesion may be clipped through with scissors, or divided by the application of a ligature.

Case 305.—Hildanus records a case of partial union of the upper eyelid to the eyeball, the consequence of a wound through the eyelid with a sword, which at the same time touched the cornea and deprived the eye of sight. The patient was afraid of allowing the adhesion to be divided with the knife, lest the eye should be opened and the humours evacuated. As a probe could be passed behind the symblepharon, Hildanus surrounded it with a silk thread, to which he appended a small leaden weight. The symblepharon was divided by the pressure of the thread, between the eighth and ninth day.[3]

If the union be immediate, the assistant draws the upper eyelid upwards, and from the eyeball as much as possible, while the operator draws the lower eyelid downwards, in order that the united places being brought into view in their whole extent, and put on the stretch, may be the more easily and accurately divided. This is to be accomplished with a small scalpel. The front of the union is always the firmest part, the interior being looser. During the separation we must avoid injuring the cartilages of the eyelids on the one hand, and the sclerotica and cornea on the other. The divided surfaces must be smeared frequently with tutty ointment, and the tendency to re-union prevented, as much as possible, by daily tearing through, with the point of a probe, any false membrane which may appear to be forming.

If the symblepharon exists through the medium of bands of organised coagulable lymph, after putting the parts on the stretch, as in the last case, we must endeavour to cut away the bands close to the eyeball, and then, laying hold of them with forceps, dissect them from the eyelids. After this is finished, following the suggestion of Mr. Wilde[4], the edges of the divided conjunctiva, on the lid and on the globe, ought severally to be brought together by sutures. This seems the most effectual mode of preventing a relapse; and, as Mr. Walton remarks[5], if there is not a sufficiency of conjunctiva in the band of adhesion to allow the edges of the wound to be so approximated, little is to be hoped from the operation.

The following method has been communicated to me by Mr. Hunt, of Manchester. Instead of dissecting away the adhesion, Mr. H. makes a puncture through it; and by passing a probe through the wound every day, he prevents its closure. This is to be done till there is no more suppuration at any part of the edges of the wound, which is now become callous. A knife is then to be introduced through the opening, and the remaining adhesion cut across.

M. Pétrequin proposes to pass a double ligature through the adhesion, tying the one towards the eyelid loosely, but that towards the eyeball firmly, so as speedily to cut through the band, and leave a surface ready to cicatrize. As soon as this is accomplished, the remaining ligature is tightened, and, dropping off, leaves a second surface to heal by cicatrisation.[6]

In the following case, a peculiar method of operating was followed by M. Blandin:—

Case 306. — In consequence of extensive ulceration of the conjunctiva of the eyeball and lower lid, from a burn, the cartilage of the lid was destroyed, adhesions formed between the globe and the lid, and the lower half of the cornea was covered by a cicatrice. M. Blandin dissected the cicatrice from above downwards, so as to remove the adhesion of the eyelid to the eyeball; and turning the dense cicatrice inwards, converted it into a substitute for the palpebral mucous membrane, and thus prevented a new adhesion from taking place. The cicatrice was in fact doubled in, like a hem, and retained in position by the glover's suture, while the two extremities of the thread were carried horizontally right and left, and fixed to the temples, so as to keep the border of the lid free of the cornea, and assist in obviating any faulty cicatrisation. The sutures were removed on the fourth day. Three weeks after the operation, the eye had quite recovered its mobility, and could be directed towards any object, while the eyelids had a rounded border, and though rather short, could be approached, without difficulty, to the upper lid, so as to effectually defend the eye from the action of light.[7]

Ammon and Dieffenbach have each invented an operation for symblepharon.

In Ammon's operation, nothing is done, in the first instance, to the symblepharon; but, by two incisions meeting at an acute angle, the adherent lid is divided in its whole thickness, so as to form a triangular flap, having as its basis the edge of the lid, and including the symblepharon. Over this triangular flap the two remaining portions of the lid are then stretched, and brought together by the twisted suture. They unite to one another, but not to the subjacent flap, on the inside of which is the symblepharon. At the end of fifteen or twenty days, when the union is consolidated, the second part of the operation is performed; which consists in dissecting out the triangular flap, which has been left adherent to the globe of the eye. After each operative proceeding, compresses wrung out of iced water are to be applied over the eye, to moderate inflammation.[8]

Dieffenbach's method consists in folding in the eyelid, so that its cutaneous surface is brought into contact with the globe of the eye after the morbid union is divided. If it is the lower sinus of the conjunctiva, for instance, which is affected, he makes an incision from the inner angle of the eye along by the side of the nose, and another, likewise vertical, from the outer angle to the lower outer edge of the orbit. He then detaches the lid from the globe of the eye, by dividing the symblepharon, and shaves off the cilia. He next folds in the quadrilateral flap upon itself, so as to produce a complete entropium, and fixes it by sutures; four are generally required. They are supported by strips of adhesive plaister, and the parts are covered by a fomentation. When the globe of the eye is once cicatrized, the artificial entropium is to be removed, and the flap fixed again in its original situation by sutures.[9]

It may be doubted whether the deformity which must result from such operations, will not counterbalance the gain to be obtained from the cure of the symblepharon.

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[1] Operative Ophthalmic Surgery, p. 129; London, 1853.

[2] Ammon's Zeitschrift für die Ophthalmologie; Vol. v. p. 59; Heidelberg, 1836.

[3] Guilhelmi Fabricii Hildani Opera Omnià; p. 502; Francofurti ad Mœnum, 1646.

[4] Dublin Quarterly Journal of Medical Science, February, 1847, p. 233.

[5] Op. cit. p. 123.

[6] Revue Ophthalmologique de la Littérature Médicale de l'Année 1842, p. 57; Bruxelles, 1843.

[7] Quoted from the Gazette Médicale de Paris pour 1846, in Walton, Op. cit. p. 123.

[8] Op. cit.; Vol. iii. p. 258; Dresden, 1833.

[9] Operative Chirurgie; Vol. i. p. 482; Leipzig, 1845.

SECTION IX.—SYNECHIA.

Συνέχεια, *continuity*, from συνέχω, *I hold together.*

The term *synechia* is employed to signify any morbid adhesion of the iris. When the adhesion is to the cornea, it is termed *synechia anterior.* (*Fig.* 53. p. 484.) This may result from a penetrating wound of the cornea, from ulcerative inflammation of that part, ending in perforation of the anterior chamber, and escape of the aqueous humour; and even from inflammation of the cornea or iris, without any perforation of the former. When the adhesion is to the capsule of the crystalline lens, it is termed *synechia posterior.* (*Figs.* 56. *and* 57., p. 540.) This is a frequent consequence of iritis.

In synechia anterior of limited extent, the adhesion may sometimes be separated by means of a needle introduced through the cornea, or the adherent part may be cut across, as I shall explain more fully under the head of *Artificial pupil.*

In synechia posterior, even when apparently the whole circumference of the contracted pupil is embraced in the adhesion, it sometimes happens in the course of months, or years, that a minute portion of the edge of the pupil becomes free, and a restoration to vision unexpectedly takes place.[1] In the case of an old man about whom I was consulted, a separation of this kind seemed to have happened to the whole circumference of the pupil, twenty years after the iritis which closed that aperture. It is probable the vitreous humour having dissolved, the lens, enclosed in its capsule, had fallen down behind the iris, as after the patient's vision was suddenly restored, the pupil appeared somewhat dilated, and the iris tremulous.

Laceration or absorption of the iris near its great circumference is another phenomenon which we occasionally witness, especially in anterior synechia. The iris is on the stretch, and gives way or is absorbed, at one or more points, so that vision is improved. According to the number of holes which have been formed, vision is sometimes rendered double, or triple.

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[1] Siemerling's merkwürdiger Fall einer vieljährigen von der Natur zweimal gehobenen Blindheit eines 92jährigen Greises; Berlin, 1818.

SECTION X. — OBLITERATION OF THE PUPIL.

Syn. — Phthisis pupillæ.

It has been fully explained, in the 19th and following Sections of the preceding Chapter, that from inflammation of the iris the pupil is apt to become narrowed, misshapen, fixed, and filled with coagulable lymph; a state of parts to which the terms *atresia*[1] *iridis,* and *synizesis*[2] have been applied. Under these circumstances, the capsule, within the verge of the contracted pupil, is either opaque or covered with opaque deposition, and to this the whole of the pupillary margin of the iris is in general firmly adherent, although not unfrequently a small part of it is free. The texture of the iris, in such cases, is apt to be so softened by inflammation, as to tear, if laid hold of by a hook or other instrument. An important fact, observed by Mr. Bowman, is that, in synizesis, generally " the body of the lens retains its transparency, and the capsule remains perfectly clear, except within the area of the pupil."[3]

Through the thin web of lymph, which occupies the contracted pupil, a very considerable share of vision may be enjoyed.

The use of belladonna in cases of closure of the pupil, ought not to be hastily abandoned, especially if any portion of the pupillary margin remains free. The filtered aqueous solution of belladonna, or the solution of atropine, dropped upon the conjunctiva once or twice a-day, and continued for several months, is often followed by some degree of dilatation of the pupil, and considerable improvement in vision. The internal and long-continued use of iodine also appears to be useful.

Dr. Lorch relates[4] an interesting case of synizesis, accompanied by three separate protrusions of the iris through as many ulcers of the cornea. The closure of the pupil was complete, and the eye thereby deprived of sight. As the prolapsed portions of the iris shrunk and the ulcers healed, the pupil opened, and vision was restored.

Woolhouse attempted with a needle, introduced through the sclerotica, to divide the whitish fibres which bind down the iris, and to open up the closed pupil; an operation which he termed *diæresis.*[5] The want of success attendant on such attempts, probably led Cheselden to the idea of forming an artificial pupil. Woolhouse was afraid to touch the uvea or the iris with the needle. Cheselden freely divided these parts, and his boldness and ingenuity were crowned with success.

SECTION XI. — CATARACTS, OR SPECKS OF THE CRYSTALLINE CAPSULE AND LENS.

The origin of these sequelæ of the ophthalmiæ has been fully explained in those Sections of the last Chapter, which treat of iritis and inflammation of the crystalline lens and capsule. When they are limited to the area of the contracted pupil, an extension of the pupil by belladonna or by operation, or the formation of an artificial pupil, may restore vision. When they extend to the whole breadth of the lenticular body, only its removal by operation can be of any avail.

SECTION XII. — OPACITIES OF THE HYALOID MEMBRANE.

I have seen three or four cases of opacities, which I judged to be the effects of inflammation on the vitreous tissue. They were generally striated, or ramose, and presented a funnel shape. In one case, I was surprised to find the patient able to read with the affected eye.

Caution is requisite in concluding on the seat of opacities, which appear to lie deep in the eye. I lately operated on a patient who, for a time, presented a funnel-shaped striated opacity, apparently at a considerable depth behind the lens of each eye. The case ended in lenticular cataract. There was nothing peculiar in the appearances of the extracted lenses; the deep-seated opacity was no longer visible after the patient recovered, and she saw perfectly. The apparent depth of the striated opacity must have been an optical deception, attributable to the effect of the lens, the aqueous humour, and the cornea.

SECTION XIII. — SYNCHYSIS, OR DISSOLUTION OF THE VITREOUS HUMOUR.

Σύγχυσις, *commixtion*, from συγχύω, *I pour together.*

Disorganization and solution of the hyaloid tissue follows various inflammatory diseases of the eye, and especially those of the choroid and iris. This state of the vitreous body is totally incurable, and comes sooner or later to be accompanied by amaurosis. When the vitreous body is dissolved, it by no means follows that the eye becomes soft or boggy; on the contrary, it often feels harder than natural, owing to a superabundant quantity of fluid occupying the place of the vitreous humour.

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[1] From α, *negative*, and τιτράω, *I perforate.*

[2] Συνίζησις, from συνίζω, *I close.*

[3] Medical Times and Gazette, January 3, 1852, p. 12.

[4] Ammon's Zeitschrift für die Ophthalmologie ; Vol. v. p. 40; Heidelberg, 1835.

[5] Mauchart, De Pupillæ Phthisi ac Synizesi; Halleri Disputationes Chirurgicæ Selectæ; Vol. i. p. 468; Lausannæ, 1755.

M. Desmarres[1] has given the name of *sparkling synchysis* (*synchysis étincelant*) to that condition of the eye in which minute, glancing crystals of cholesterin are seen moving up and down within it; a phenomenon which had been observed by Parfait-Landrau[2], Dr. Jacob[3], and myself[4]; and which seems oftenest to be the result of the breaking up of a traumatic lenticular cataract, but to the existence of which, dissolution of the vitreous humour is not essential. M. Malgaigne[5] was the first to suggest that the particles in question consisted of cholesterin; a view of the matter which was confirmed by the analysis of Professor Aldridge, in a case operated on by Mr. Wilde.[6]

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[1] Annales d'Oculistique, Novembre, 1845; p. 220.

[2] Revue Médicale; Tome iv. p. 203; Paris, 1828.

[3] Dublin Medical Press, January 25, 1843: Ibid, December 11, 1844.

[4] Edinburgh Medical and Surgical Journal; July, 1845; p. 73.

[5] Annales d'Oculistique, Novembre, 1845; p. 223.

[6] Dublin Quarterly Journal of Medical Science; May, 1848; p. 498.

SECTION XIV.—ATROPHY OF THE EYE.

Syn.—Phthisis oculi.

Fig. Beer, Band II. Taf. II. *fig.* 7. Demours, Pl. LXI. *fig.* 1. Ammon, Thl. I. Taf. I. *figs.* 24, 25.

Certain severe or long-continued ophthalmiæ, occurring in childhood, are apt to impede the growth of the eye, so that it remains through life less than the average size; or, attacking the adult, they are followed by abnormal absorption, or imperfect regeneration of the contents of the eyeball, and a shrinking of its coats. We often see the cornea, and sometimes the whole eyeball, continue dwarfish, after the scrofulous varieties of ophthalmia, and after inflammation, excited by injuries of the eye, in scrofulous subjects. I have seen the eye shrink to less than half its size from Egyptian ophthalmia, the pupil remaining open, though not larger than a pinhole, and the cornea greatly contracted, yet still clear. The person saw none with the eye in this state. In cases of syphilitic iritis it sometimes happens, that after mercury has caused the absorption of effused lymph, or of those tubercles which rise upon the surface of the iris, there follows, in consequence of the altered state of the internal parts of the eye, such a degree of absorption as produces flaccidity and wasting of the bulb, which, under these circumstances, assumes a square form, being depressed opposite to the insertion of the four recti muscles, while the pupil closes, the cornea shrinks and becomes opaque, and the eye sinks back in the orbit. In such cases the atrophy extends to the optic nerve, and may sometimes be traced, on dissection, involving the the opposite tractus opticus as far as the corpora quadrigemina.[1] Arthritic iritis is also frequently followed by atrophy of the eye.

Flexibility of the cornea, or of the sclerotica, is one of the surest signs of the presence or of the previous existence of retinitis, and is evidently owing to a diminution in the contents of the eyeball, and chiefly of the vitreous humour. When the retinitis is recent, the eyeball may regain its natural consistence, under the influence of appropriate treatment. (See pp. 577, 601.) When the internal inflammations of the eye are neglected, along with total amaurosis and flexible cornea, the case is apt to end in complete absorption of the vitreous humour; while the retina, having become opaque, comes into view, being folded together into the form of a cord or narrow funnel, stretching directly forwards from the optic nerves to the posterior edge of the suspensory ligament of the crystalline. A watery effusion takes place, in such circumstances, between the choroid and the coarcted retina. If the lens is opaque and is artificially removed, the retina comes into view in this state. Generally, however, the pupil is contracted and adherent. On dissecting such eyes, the choroid is sometimes found partially ossified. Along with contracted pupil it is not uncommon to find, in atrophied eyes, the lens partially ossified. Several specimens of coarcted retina, ossified choroid, and ossified lens, in atrophied eyes, I have now before me.

It is not in scrofulous subjects alone that traumatic ophthalmia is liable to be followed by atrophy. Nor is it necessary that the injuries should be severe to produce this effect. Even the wound produced by the introduction of a couching-needle, is sometimes followed by such inflammation as destroys the secreting powers of the eye, so that the regeneration of the humours is impeded, and the organ shrinks.

In all degrees of atrophy of the eye the prognosis is unfavourable. Even where there is as yet no apparent diminution in the size of the eye, if the cornea or sclerotica be more than naturally flexible, (a symptom denoting an atrophic tendency,) we generally find, on careful examination, that the retina is imperfectly sensible. Operations upon such eyes, and still more upon those which have shrunk below their natural size, generally fail to produce any benefit. The same holds with regard to congenitally dwarfish eyes affected with cataract.

Atrophy of the eye is often attended with chronic inflammation, and with neuralgia of the ocular branches of the fifth nerve; symptoms which are much relieved by the internal use of belladonna or of aconite.

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[1] Cloquet, Pathologie Chirurgicale, p. 132, pl. x. fig. 4, 5, 6; Paris, 1831.

SECTION XV.—STAPHYLOMA.

From *σταφύλη, a grape.*

Various protrusions, generally from the front of the eye, arising from morbid changes in the texture, and a yielding, of its coats, have received the name of *staphyloma,* from the resemblance they occasionally bear to a grape.

§ 1. *Staphyloma Uveæ, or Iridoncosis.*

Iridoncus, or *iridoncosis,* from *ἶρις, iris,* and *ὀγκὸς, tumour.*

Those conversant with diseases of the eye must have observed the peculiar state of the iris consequent to iritis, which Professor Jäger, of Vienna, designates by the name of *staphyloma iridis,* and for which Dr. Klemmer proposes[1] that of *iridoncosis.* The anterior surface of the iris, in the diseased condition to which these names are applied, has at one or more spots lost its natural colour, having become blackish, or even presenting a hue so deeply black that we might suspect the iris to have been absorbed at the part affected, or a piece of it cut out for the formation of an artificial pupil. (*Fig.* 61.)

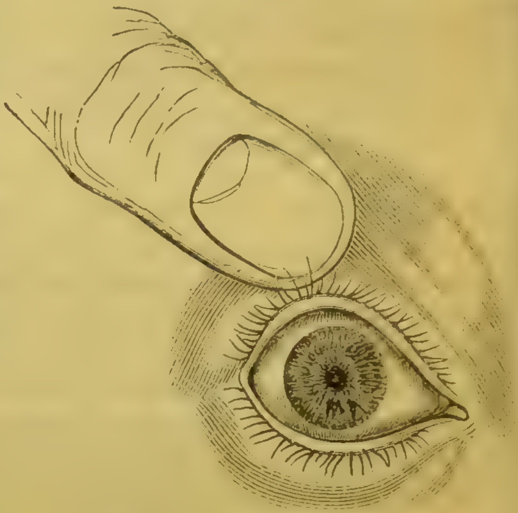
Fig. 61. (From Klemmer.)

Jäger's pathology of this state of the iris is very different from that of Klemmer. Both are agreed that it is one of the sequelæ of chronic, and generally of some specific, iritis. Syphilitic iritis is the most frequent cause. One of the most remarkable cases I have seen, was the result of ophthalmia, after small-pox, in a child three months old. In consequence of inflammation Jäger thinks the iris loses its natural firmness of texture, and becomes preternaturally adherent to the subjacent uvea. Next, he believes the aqueous humour of the posterior chamber presses the uvea forwards through the attenuated iris, and that thus the staphyloma iridis is formed. *Staphyloma uveæ* would be a more correct appellation, and would serve to distinguish this affection from a protrusion of the iris through the cornea. Jäger has not himself published on the subject; but in the account of his doctrine furnished by Dr. Froriep[2], and referred to by Klemmer, no notice is taken of the influence which a contracted and adherent state of the pupil is likely to have in promoting the pressure forwards of the uvea by the aqueous humour, in consequence of this fluid not being permitted to flow in what is generally regarded its natural course, namely, through the pupil into the anterior chamber.

That in such cases as Jäger designates by the name of staphyloma iridis, the iris is not actually absorbed in its whole thickness, is proved by the want of sight, and by the fact that, under the circumstances in question, he has formed an artificial pupil with success.

Klemmer proposes *iridoncus* or *iridoncosis* as an appropriate name for this sequela of iritis, which he contends is not a thinning, but a thickening, of the iris; not a shining through of the uvea, but a deposition of coagulable lymph in the parenchyma of the iris. The proofs he gives of this opinion are incomplete; and no less so is his refutation of Jäger's doctrine on the subject. For any thing yet established, each of these conditions of the iris may occasionally occur. Which is the more frequent, and by what marks they are to be distinguished, must be left for future inquirers to determine, and especially for those who shall have opportunities of dissecting eyes affected with the consequences of iritis.

Sometimes the black discoloration exists in small insulated points; in other instances the whole iris is affected, except towards the pupil, where the iris generally preserves its natural texture. Sometimes the black colour forms a narrow ring close to the great circumference of the iris; in other cases it presents a triangular form, the basis of the triangle being turned towards the ciliary, and the apex towards the pupillary, margin of the iris. The surface of the affected part may be uniform or bossulated; it often presents a striated appearance, from the vessels or nerves passing through it; the colour is not always black, but is sometimes grey or blueish white, or blackish blue.

Klemmer relates only one dissection, and that of the eye of an ox.

§ 2. *Staphyloma of the Iris, or Staphyloma racemosum.*

From racemus, *a bunch of grapes.*

Fig. Beer, Band II. Taf. I. *figs.* 1, 3, 4. Dalrymple, Pl. X. *figs.* 6, 5.

A portion of iris protruding through a wound of the cornea, as, for instance, the incision made for the extraction of cataract, is sometimes styled a *staphyloma iridis;* but, in general, this term is reserved to protrusions arising from partial or general destruction of the cornea by abscess and ulceration. From whatever cause it may arise, the appropriate name for such a protrusion would be *staphyloma iridis per corneam.* There may be a single protrusion of this kind, formed of a portion only of the iris, or of the whole iris, with the pupil closed; or there may be several protrusions, for it sometimes happens that the cornea is perforated by ulceration, not in one point alone, but in many; and that through the openings thus formed, the iris, protruding, gives rise to an appearance somewhat like a brambleberry, or a cluster of berries (*fig.* 62.), whence the name *staphyloma racemosum.* Dr. Hasner's view of the formation of a staphyloma racemosum, embracing thus the whole extent of the destroyed cornea, is somewhat different. He thinks that there are formed fibres which stretch from one edge of the ulcerated cornea to the other, and progressively form a network, in the interstices of which the protrusions of the iris take place.[3] The protrusions of the iris generally present a dark, or even black colour, and a smooth glistening surface. One or more of them occasionally give way, and allow the aqueous humour by which they have been over-distended to escape. The staphyloma consequently becomes flat, and may disappear altogether, the cornea cicatrizing over the seat of the former protrusion. It sometimes happens that this sort of staphyloma meets with an accidental cure, a blow bringing on inflammation, which ends in atrophy of the eye. In other cases, the staphyloma of the iris degenerates into staphyloma of the cornea and iris; the exposed iris becoming covered by an effusion of lymph, which is gradually converted into a cicatrice,

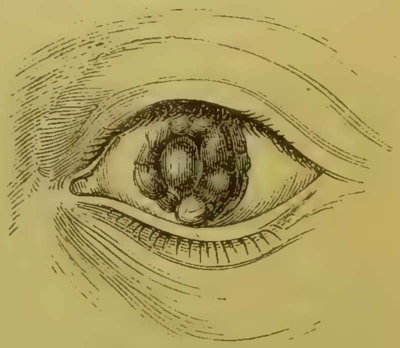

Fig. 62. (From Beer.)

or pseudo-cornea, so that the front of the eye assumes a white, opaque appearance, but still presents an unnatural projection.

Prognosis and treatment. — If any considerable portion of the cornea be in a natural state, it may be possible to form an artificial pupil behind that portion, after the staphyloma of the iris is removed, which is sometimes effected by puncturing the individual protrusions with the point of a cataract needle, and touching them with a pointed pencil of lunar caustic. If more considerable, they may be snipped off, and the place touched in the same way. When the whole cornea is affected, nothing can restore vision. The staphyloma may be punctured occasionally; but it is better to remove it entirely by the knife, exactly as a total staphyloma of the cornea and iris is removed, which will be followed by a flat and opaque cicatrice, or pseudo-cornea.

§ 3. *Staphyloma of the Cornea and Iris.*

Fig. Wardrop, Pl. VIII. *figs.* 3, 2. Pl. IX. *fig.* 3. Beer, Band II. Taf. II. *figs.* 4, 5. Demours, Pl. LX. Pl. LXI. *fig.* 1. Ammon, Thl. I. Taf. V. *figs.* 7, 8, 9, 11—16. Dalrymple, Pl. XI. *figs.* 1, 2. 4. Pl. XVI. *fig.* 5.

A *staphyloma corneæ et iridis*, as it is technically termed, is a cicatrice, spread over the iris and adhering to it, occupying the place and presenting somewhat of the form of the cornea, but totally opaque. This cicatrice is generally much thicker and denser than the natural cornea; often, indeed, as firm as cartilage, and perhaps the tenth of an inch thick. A staphyloma of the cornea and iris is not so much, what it was once supposed, a degeneration of the old cornea; not so much an opaque and thickened state of those textures which were formerly thin and transparent, as a new and morbid product, occupying the place of that portion of the cornea which has been destroyed by abscess and ulceration. If an onyx gives way, and the cornea is perforated, with no extensive ulceration round the perforation, partial staphyloma will probably be the result. If around the perforation, even when it is small, there is extensive and deep ulceration of the cornea, so that it is much thinned, total staphyloma will generally ensue. If the whole thickness, and almost the whole extent, of the cornea are destroyed by abscess and ulceration, still more certainly will total staphyloma be the consequence.

To the inner surface of the cicatrice or pseudo-cornea, the iris is always adherent. A mere opacity of the cornea, in consequence of inflammation, never produces staphyloma. The iris, as has been explained in a preceding section, sometimes forms adhesions to the internal surface of the cornea, from inflammation; but neither does this *anterior synechia*, as it is termed, ever end in staphyloma, unless the cornea has been at least partially destroyed, and has actually given way. It is not adhesion of the iris to the cornea, but it is a covering up of the exposed iris by a new tissue altogether, which lays the foundation for staphyloma, and constitutes an essential character of the disease. This is a point which has been illustrated in a masterly manner, and established beyond controversy, by Mr. Wharton Jones.[4]

This kind of staphyloma is styled *partial* or *total*, according as it involves a portion only, or the whole extent of the cornea and iris. The most evident symptom is an opaque projection in the situation of the cornea, generally of a white colour, but sometimes blueish or greenish. If the destruction of the cornea and consequent protrusion of the iris have been limited, the staphyloma is generally partial; if the whole or greater part of the cornea has been destroyed, the whole iris, no longer supported in front, is pushed forwards along with the lens, and the staphyloma is total. In partial staphyloma, the protruded iris is covered with a cicatrice, continuous with the portion of the old cornea which remains, and which preserves its transparency. In total staphyloma, the iris being protruded in the form of a round tumour, is gradually invested by an opaque cicatrice, embracing the whole extent of the natural cornea.

The doctrine of staphyloma is beset with exceptions. Even when the cornea has been partially destroyed, and actually given way, the case does not necessarily terminate in staphyloma, partial or total; but a mere leucoma, with synechia anterior, may be the result. It would likewise be erroneous to suppose that total staphyloma requires the whole, or even the greater part, of the cornea to be destroyed before it can take place; although, no doubt, this is generally the case.

Case 607. — A young lady was seized with small-pox, when at school in Edinburgh. She was brought to me with both corneæ perforated in their centre by an ulcer, through which there was a protrusion of the iris, not bigger than the head of a fly; the rest of the cornea being clear and allowing the iris to be distinctly seen. I hesitated not to assure myself that, after the ulcers should heal, I should be able to form an artificial pupil in one eye, if not in both. The ulcers gradually closed, a white dense substance forming the cicatrice in each; but scarcely was the cicatrization complete, when the iris and cornea, now in contact with one another in all their extent, began to be elevated, and in each eye formed a total spherical staphyloma, so prominent in the left eye that the lids with difficulty closed over it.

The relative size of the portion of each cornea destroyed by ulceration, was about one-fifth of its whole diameter.

I attributed the staphylomatous protrusion, partly to the complete closure of the pupil in each eye, and partly to the close approximation of the whole iris to the cornea, and consequent obliteration of the anterior chamber. There was no visible effusion of lymph, glueing the iris and cornea together; but gradually as they protruded, the cornea grew dim, so that the iris could no longer be seen. No doubt, lymph must have been effused, and connected the two structures. After a time, the centre of the staphyloma of the left eye began to grow thin from distension.

On dissecting such a staphyloma as occurred in the case now related, we should expect a different anatomical structure from what occurs in common staphylomata of the cornea and iris. We should expect to find a considerable portion both of the anterior and posterior elastic laminæ entire, with the natural lamellated tissue distended, but not destroyed, except in the centre of the protrusion, where ulceration had at first taken place: whereas, a common staphyloma, as Mr. Bowman has shown[5], consists of a dense and irregular interweaving of white and yellow fibrous tissue, the meshes of the tissues being large, unequal, and open on all sides; the anterior surface formed by a thick coat of epithelium resembling cuticle, but without either anterior or posterior elastic lamina.

Causes. — Small-pox being extremely apt to produce extensive onyx, ending in ulceration and bursting of the cornea and protrusion of the iris, staphyloma was a much more frequent occurrence, before the general introduction of vaccination than it is at present. The ophthalmia of new-born children, the contagious or Egyptian, the gonorrhœal, and severe scrofulous and traumatic ophthalmiæ, are the most common causes of staphyloma at the present day.

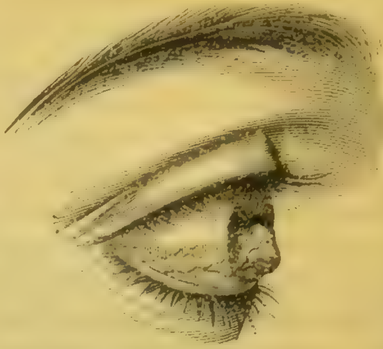

Fig. 63.

1. *Partial staphyloma of the cornea and iris,* generally the result of an onyx of limited extent, which, having burst, has given rise to perforation of the cornea, occupies, in nine cases out of ten, the lower part of the cornea. (*Fig.* 63.) It is generally of a white colour, the pseudo-cornea thick and dense, and less liable to expand than in total staphyloma. In those cases where it does not cover nor involve the pupil, the patient is able to see, with more or less distinctness, objects placed above him, or on a level with his eye; but he is generally affected with epiphora, and painful sensibility of the organ. In more unfortunate cases, the whole edge of the pupil is adherent to the internal surface of the opaque projection, and the patient can recover a degree of vision but by the formation of a lateral artificial pupil. It sometimes happens, however, that a partial staphyloma, occupying the centre of the cornea, and involving the whole edge of the pupil, contracts in time to such a degree, that the iris at one or more places gives way, or is torn from the choroid, so that one or more false pupils are formed, through which the patient obtains some accession of vision. In other cases, central partial staphyloma, not being completely consolidated, goes on projecting more and more, and ends at last in total staphyloma.

Diagnosis. — Leucoma and anterior synechia are sometimes mistaken for partial staphyloma, although by careful examination of the eye this error may always be avoided. To the whole extent of the protuberant part of a partial staphyloma, the iris is adherent, so that the anterior chamber is much diminished in size; in simple leucoma, the iris is not at all adherent to the cornea, while in synechia, though there is an opacity of the cornea, to the internal surface of which the iris is adherent, there is no unnatural elevation or protrusion. In partial staphyloma, the whole cornea partakes in some measure of a conical form, the termination of the cone being at the centre of the staphyloma; whereas, in leucoma and synechia, the general spherical form of the cornea remains unaltered, the opaque spot being rarely raised above the level of the cornea, and not unfrequently depressed.

Treatment. — A small partial staphyloma, which is white and dense, with the pupil partially or entirely open, and which shows no disposition to increase, ought not to be interfered with. The formation of an artificial pupil in such an eye may be called for, when the opposite eye is blind.

The degree of vision which a partially staphylomatous eye often possesses, may readily be lost, either by inattention, or by injudicious attempts to remove or lessen the disease. When such an eye is injured or attacked by inflammation, and neglected, the tumour is apt to increase in size till it projects from between the eyelids, so that it is constantly irritated by contact with their edges, the eyelashes, and foreign bodies. In these circumstances, the patient ought to submit to such treatment, as, if carefully conducted, is likely not only to improve very materially the form of the eye by lessening the staphyloma, but to save the remaining sight. He must be informed, however, that notwithstanding the removal of the partial staphyloma, it will be impossible for him to recover the transparency of the cornea in the part affected. After the most successful treatment, a very visible, white, but flat, cicatrice will remain.

If the apex of a partial staphyloma, being dense and white, stands out so prominently that it impedes the ready closure of the eyelids, or prevents the application of an artificial eye, it may be shaved off to a level with the rest of the staphyloma, by means of the cataract-knife.

By means of a gradual, moderate, and repeated inflammatory process, cases of partial staphyloma, in which the pupil is partially or entirely open, can sometimes be improved, without endangering the general form of the eye, or the remaining degree of vision. The inflammation is to be excited by the cautious use of escharotics, continued till such contraction and firm cohesion are produced in the pseudo-corneal tissue, that it shall be able to resist the pressure of the aqueous humour. The eyelids being held widely apart, the apex of the staphyloma is to be touched with a pointed pencil of caustic potash, or of nitrate of silver. Before allowing the lids to close, the surface of the staphyloma is to be washed with a large camel-hair pencil dipped in oil. The part touched with the escharotic forms a small eschar, which drops off in the course of some days, leaving an ulcer, which, as it cicatrizes, produces a degree of shrinking and flattening of the staphylomatous tissue. The caustic is not to be repeated, till this process of reparation seems completely to have terminated. Months require to elapse, before any attempt should be made to form an artificial pupil, under such circumstances.

When, either from closure of the pupil, or from the partial staphyloma being situated over it and involving it, no vision exists, we must direct our attention to the diminution of the staphyloma, and removal of the pain and irritation by which its increase in size is attended; and determine whether, by an operation for artificial pupil, we are likely to gain for the patient some restoration of sight. Under such circumstances, a similar use of escharotics may be adopted, as in cases where the pupil is open; but it is particularly recommended by Roser[6], on the authority of Beer and Steinberg, that we should endeavour to re-establish the communication between the anterior and posterior chambers. This is to be done, either by forming an artificial pupil, or by separating the adhering portion of the iris from the cornea, so as to restore the pupil; an operation which may be called *abscission.*

2. *Total staphyloma of the cornea and iris,* although it may occasionally present a form somewhat conical, is generally hemispherical. (*Fig.* 64.) It often, however, from dilatation, approaches to a globular form.

Beer distinguished two varieties of total staphyloma, a *spherical* and a *conical;* and was of opinion, that in the spherical the anterior chamber was abolished, while the posterior continued to exist; but that in the conical, both chambers were obliterated. This distinction is ill founded; for on excising a spherical staphyloma, it is not uncommon to find the crystalline in an opaque state, adhering to the iris and pseudo-cornea, so that there is no aqueous chamber. In general, no doubt, the crystalline is not so adherent; but a large quantity of aqueous fluid is lodged between it and the internal surface of the staphyloma. Sometimes the crystalline is transparent; often it is not seen at all, having probably become detached and sunk into the vitreous humour. Various opinions have been formed of the nature of the disease described by Beer, under the name of *total conical staphyloma;* some supposing it to be the result of corneitis, others ascribing it to choroiditis.[7] It seems most likely that it is nothing else than a highly inflamed state of the cornea. This view of the matter is confirmed by the statement of Beer, that the tumour never enlarges, nor becomes so thin that it bursts, as is often the case with spherical staphyloma; that its apex sometimes ulcerates, at which time the tumour is covered with red vessels from the sclerotica and conjunctiva; and that great part of the tumour may be destroyed by the process of ulceration, which is attended by much pain, and renders the opposite eye weak. All this we see occasionally in bad cases of corneitis.

Fig. 64.

The size attained by a total staphyloma depends much on the degree of activity possessed by the source of the aqueous humour, residing in the posterior chamber. The less this source has suffered from the preceding inflammation, the greater will be the quantity of aqueous humour secreted, and the greater consequently the expansion of the united iris and pseudo-cornea. Although at first extremely thick and very tough, so as almost to resist division with the knife, we not unfrequently see a total staphyloma become in time so thin and transparent, from distention and interstitial absorption, that the patient is able to distinguish a number of objects around him, and fondly deceives himself into a hope of complete recovery of sight from the operator. This appearance is the forerunner of the bursting of the staphyloma, which is followed by a sinking away of the tumour for a day or two, but is soon succeded by its re-appearance in its former shape, and with its former dimensions.

When a total staphyloma attains a large size, the iris, unable to expand to the same degree as the pseudo-cornea, and its texture much more frail, separates from the choroid, and becomes torn into shreds, so that when we examine the internal surface of such a staphyloma, after death, or after it has been removed by an operation, we find the iris which adheres to the pseudo-cornea, broken and reticulated (*Fig.* 65.); whereas the internal surface of a staphyloma which has not reached a great size, exhibits the iris still entire.[8] (*Fig.* 66.)

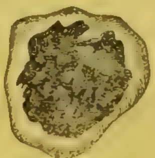

Fig. 65. (From Beer.)

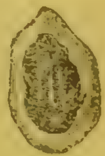

Fig. 66. (From Beer.)

Total staphyloma, altogether neglected, sometimes reaches a prodigious size, and involves the sclerotica and choroid, as well as the cornea and iris. The whole eyeball is in this case greatly expanded; and the sclerotica being much attenuated, permits the choroid to shine through it, while the eye assumes a deep blue colour.

Prevention. — When we see an eye destroyed by total abscess and ulceration of the cornea, as we often do from ophthalmia neonatorum, we readily foretell the probability of the case ending in total staphyloma. The question has been agitated, Is there no method of preventing this termination? Now, it sometimes happens, that although the cornea is entirely destroyed in purulent or some other ophthalmia, staphyloma does not result, but the cicatrice which forms in the place of the cornea, continues flat, and the eye becomes atrophic. Mr. Jones conjectures, that in such cases, the lens has escaped through the ulcerated cornea; and proposes as a probable means of preventing staphyloma, the removal of the lens, before the process of cicatrization has commenced. For this purpose it will sometimes be necessary to make an incision through the iris, as the pupil is generally closed in those cases where the cornea has been destroyed by suppuration. Mr. Jones conceives that the supply of aqueous humour in the still existing posterior chamber keeps up the distention of the iris, on the surface of which the pseudo-cornea is moulded in the form of a round prominence. To break in upon the integrity of the posterior chamber, therefore, he would extract the lens; a proposal which he put in practice in the following case: —

Case 608. — A man, about 22, came to Mr. Jones labouring under the effects of severe purulent ophthalmia of both eyes. In the right eye, the cornea being destroyed, and the pupil closed, the iris protruded and was distended with aqueous humour. The left eye had also suffered very much; there was penetrating ulcer, prolapsus iridis, and consequently distortion and contraction of the pupil. Both eyes were still affected with the inflammation, and it was very doubtful whether the left eye could be prevented from getting worse, especially as it was evidently kept in a state of additional irritation from the presence of the staphyloma in the right. By an incision with a Beer's cataract-knife through the protruding and distended iris, the lens was extracted. Severe re-action followed; less perhaps in consequence of the operation, than from the patient not being in a situation to take proper care of himself. The iris did not again become distended; on the contrary, the eye shrunk, and irritation being thus removed, the left eye progressively improved, as far as the organic changes it had undergone allowed, and further than had been hoped for, sufficient vision being preserved to enable the patient to resume employment as a porter.

Laying hold of the exposed iris with the forceps, and removing it from the eye, is another means, which would have the effect of preventing the formation of staphyloma. If this were done, the pseudo-cornea would be formed on the surface of the crystalline lens, and thus a better form of the eye be preserved than if the lens were removed.

Prognosis. — There is no possibility of restoring sight to the patient affected with total staphyloma, even in cases where there may be reason to suppose the lens, vitreous humour, and retina to be sound. All that we can do in the way of relief is to remove a tumour which is extremely unsightly, and frequently very painful. If a staphylomatous eye receive a blow, it is apt to burst, in consequence of which, blood and water are discharged, the wound heals, and sometimes the tumour shrinks, and never returns. Projecting beyond the eyelids, a staphyloma keeps up constant irritation, and renders the opposite eye unfit for exertion. Attacked by catarrhal or by traumatic inflammation, a staphylomatous eye is apt to become gangrenous, and the tumour to slough; thus undergoing a painful natural cure. It is proper, therefore, to remove as soon as possible, every considerable total staphyloma. This affords the patient a great degree of relief, and enables him to use the opposite eye with freedom.

Treatment.—Many proposals have been made for removing total staphylomata without excision. The application of the muriate of antimony has been particularly tried, in consequence of the recommendation of Richter. It was also supposed that by mere incision of the staphyloma, passing a thread through it, or excising a small part of it, so that the eye was kept open for a time, a cure could be accomplished.[9] All these have been found to fail. Incision is merely a palliative; the seton is tedious, and not to be depended on; escharotics are apt to excite the eye into a state of violent inflammation. Beer, on the other hand, mentions that he had removed 216 staphylomata by operation, and that in not a single instance had any dangerous accident followed.[10]

Operation. — It is of great importance to preserve the lens and vitreous humour in this operation. If the patient, being a child, cries and struggles much, these textures are forced out of the eye and lost. It is proper, therefore, to put children under chloroform when about to have a staphyloma excised.

The operation consists, first, in the formation of a flap with the knife; and secondly, in the removal of the flap with the scissors.

While the assistant keeps the upper eyelid raised, a pretty large sharp hook is passed through and through the staphyloma, or it is transfixed with a small curved needle, carrying a waxed linen thread. In the hand which does not hold the hook or ligature, the surgeon takes the staphyloma-knife, which is nothing more than the cataract-knife enlarged. With the cutting edge directed upwards, the staphyloma is penetrated at its temporal edge, close to its basis, and at such a distance below its transverse diameter, that two-thirds of the tumour shall be included in the incision to be made with the knife. The point of the knife being directed perpendicularly into the edge of the staphyloma, till the operator is pretty confident that he has penetrated the pseudo-cornea, its handle is then to be carried back till the instrument assumes a position parallel to the basis of the staphyloma. The knife is now to be carried onwards till it reaches the point of exit, which ought to be in a horizontal line with the point of entrance. The flap is completed by the progressive motion of the knife, till it cuts itself out. The operation is instantly to be finished, by dividing with the curved scissors that part of the circumference of the staphyloma which is yet entire and in connection with the sclerotica. At the same moment, the assistant lets fall the upper lid, which must not again be raised for eight or ten days.

During the whole operation, and especially towards the end, care must be taken that the eyeball is not irregularly and forcibly pressed or dragged, as this might readily give rise to the escape of the lens and vitreous humour. Frequently no trace of lens is seen; it seems either to have been removed by absorption, or sunk out of view into the dissolved vitreous humour. Often it is impossible to avoid the loss of the lens, or, if the lens is wanting, of part of the vitreous humour, either from adhesion between the capsule of the lens and the iris, so that the knife passes behind the lens and through the vitreous humour; or from a dissolved state of the hyaloid membrane, frequently attendant on total staphyloma.

If the sclerotica has taken a considerable share in the disease, and there is a number of dark blue protuberances round the staphylomatous cornea (*staphyloma scleroticæ racemosum*), rather than confine the operation to the removal of the cornea and iris merely, it is better to take away the anterior third of the eyeball; an operation which, though occasionally followed by shrinking of the remains of the eye to a very small size, in general leaves it sufficiently large to support an artificial eye.

After the operation for staphyloma, the eye is to be covered with a spread pledget and compresses of lint, supported by a double-headed roller, which is to be applied first of all several times round the head and over the eye, and then over the crown of the head and under the chin, so as to prevent the dressings from slipping, and the lids from moving. On examining the eye some eight or ten days after the operation, we find the gap in the front of the eye considerably contracted, and occupied by a grayish semitransparent effusion of lymph, which gradually becomes opaque, and at last is converted into a firm cicatrice, with bluish or brownish streaks, occupying the place of the staphylomatous cornea. As to the form of the eyeball, if the lens and vitreous humour have been preserved, it has lost only the projection of the cornea; in other cases, it is more or less sunk, and generally assumes a somewhat square shape, from the action of the recti. After complete recovery from the operation, an artificial eye may be worn, by which a high degree of illusion may be produced.

Some blood is generally discharged at the moment of the operation; but occasionally it happens, especially where the disease has extended backwards, so as to involve the sclerotica and choroid, that either immediately, or some hours after the operation, a more considerable hæmorrhage takes place, both from the eye and into its cavity. A bloody dark-coloured mass, of considerable consistence, protrudes to such an extent from the wound, that it is impossible for the patient to keep the eyelids shut. The eyeball is painfully distended, while the conjunctiva and lids become greatly ecchymosed. The hæmorrhage into the eye gives rise in some cases to agonizing pain, causes vomiting, and may even bring on convulsions. Under such circumstances, we ought to cut away with the scissors the protruding substance, which perhaps is in some cases the hyaloid membrane injected with blood, but in other cases is nothing more than a clot, hanging from the front of the eye. After this is done, the bleeding ceases, and the pain abates. If we do not remove the protruding mass, but leave it to itself, it dies away in the course of a few days. The eye, thus affected with hæmorrhage, is apt to shrink below the usual size of a staphylomatous eye after operation. In this state, it does not answer so well for the application of a glass eye, and therefore all causes likely to occasion hæmorrhage ought to be guarded against.

It occasionally happens that the opening into the eye, formed by the removal of the staphyloma, is long of closing, no pseudo-cornea nor lymphatic effusion being present when we open the lids on the eighth or tenth day, and even for weeks the clear humours lying uncovered behind the gap in the front of the eye. At length, however, the aperture contracts and cicatrizes. Fungous granulations sometimes sprout from the aperture, requiring the use of lunar caustic. If the eye is not kept shut after the operation, the lens may come forward and protrude through the wound. When this is the case, the lens should be removed, and the eye kept closed till the cicatrice is formed.

Violent inflammation (*ophthalmitis phlegmonosa*) sometimes supervenes to the operation for staphyloma, ending in suppuration both within the eyeball and in the orbital cellular membrane. This must be combated by a strict antiphlogistic plan of treatment; opiates will be required to abate the severity of the pain, a poultice is to be laid over the eye, and any abscess which may form is to be immediately opened with the lancet.

§ 4. *Staphyloma of the Choroid and Sclerotica.*

Fig. Demours, Pl. LXIII. *fig.* 1. Ammon, Thl. I. Taf. IV. *fig.* 21. Taf. V. *figs.* 17—20. Taf. VII. *figs.* 5, 6, 7. Dalrymple, Pl. XX. *fig.* 6. Pl. XXIV. *figs.* 5, 6.

This kind of staphyloma, called indifferently *sclerotic* or *choroid staphyloma*, is a frequent consequence of scrofulous sclerotitis; it originates also in chronic choroiditis, syphilitic iritis, and occasionally in other ophthalmiæ. It is often the result of injury, especially of penetrating wounds of the sclerotica and choroid. It is either *partial* or *total*. In the former, sometimes a single limited spot of the sclerotica, lined generally, we have reason to believe, by the adhering choroid, stands abruptly elevated above the level of the eye, and of a dark blue colour. When a circle, more or less complete, of such protrusions surround the cornea, the corpus ciliare is regarded as the part principally implicated in the disease, which is therefore called *staphyloma corporis ciliaris*, or *staphyloma scleroticæ annulare*. The anterior half of the sclerotica is the part generally affected (*staphyloma scleroticæ anticum*); but in some rare cases (see p. 517) a *staphyloma scleroticæ posticum* has been met with, on dissection. A *general sclerotico-choroid staphyloma* is not unfrequent, in which the whole eyeball is dilated, and of a dark blue colour. In such cases the cornea is sometimes semi-transparent, and the aqueous chambers abnormally expanded. In other cases, a specimen of which I have now before me, no limit is discernible externally between the sclerotica and the cornea; the latter being opaque, with the iris adherent to its inner surface, the pupil closed, the lens hanging by a pedicle of lymph from the closed pupil, the ciliary body entire, but greatly expanded.

In every case of choroid staphyloma, the dilated portion of the sclerotica is greatly thinned; the choroid also is thinned; and, in general, the two are abnormally adherent. The disease is always attended with dropsy of the eye; and to the water, accumulated beneath the attenuated tunics, is the blue colour of the tumour to be attributed.

The appearance of the annular variety of this staphyloma is represented in *fig.* 54, p. 517; and that of the total, with the cornea semi-opaque, in *fig.* 55, p. 519. A partial choroid staphyloma resulting from an injury is represented in *fig.* 46, p. 397, and the annexed figure (*fig.* 67.) represents a general choroid staphyloma in a patient of mine, also originating in traumatic inflammation, with the fibres of the sclerotica in a remarkable manner separated, and, as it were, unravelled. The front of the sclerotica was in this case pretty entire, but covered with numerous varicose vessels. The cornea in neither of these last two cases was involved in the staphylomatous degeneration.

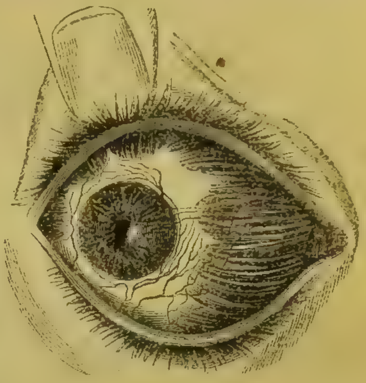
Fig. 67.

A choroid staphyloma, having often somewhat of a malignant air, is apt to be taken for a melanotic affection. In choroid staphyloma, whether general or partial, the cornea does not suffer any diminution of size, but is often expanded; but in melanosis, the cornea, when the protrusion is on one side of the eye, which is generally the case, becomes deformed, flattened, and shrunk. A puncture, however, will at once decide the diagnosis; for if the case is one of choroid staphyloma, a puncture discharges immediately a large quantity of watery fluid, and the tumour becomes flaccid; but if it is one of melanosis, a black semi-solid substance protrudes, without any diminution in the size of the eye.

Choroid staphyloma often results from syphilitic inflammation, and sometimes yields to mercury. It generally occupies the temporal side of the eyeball in such cases, and raises the edge of the cornea much above its natural level. Under the use of iodide of potassium, I have known such a staphyloma entirely to subside, and leave a depression, instead of the protrusion which formerly existed. The eye was rather atrophic, but retained some share of vision.

Puncturing the eye is a practice whence much advantage is derived in choroid staphyloma. (See page 522.) We sometimes meet with an unexpected occurrence in performing this operation. The fluid vitreous humour, instead of flowing out of the eye, insinuates itself between the sclerotica and conjunctiva, so that the eye is apparently not reduced in size, but looks rather larger. The patient also feels more tension and pain than he did before. Gradually the fluid is removed by absorption, and sometimes the pressure appears to have a good effect, the eye never filling again, but remaining of a small size.

When a partial choroid staphyloma near the front of the eye is very prominent and insulated, it may be removed like a staphyloma of the cornea and iris. By passing a thread through it, the fluid contents of the tumour drain off; and the staphyloma, now become flaccid, may be snipped off with the scissors.

In cases of general choroid styphyloma, involving the cornea and iris, the anterior third of the eyeball is to be extirpated, so that the eye may shrink to a size fit for the application of an artificial eye.

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[1] Ammon's Zeitschrift für die Ophthalmologie; Vol. v. p. 262; Heidelberg, 1836.

[2] De Corneitide Scrofulosa; p. 9; Jenæ, 1830.

[3] Entwurf einer anatomischen Begründung der Augenkrankheiten; p. 145; Prag, 1847.

[4] London Med. Gaz.; Vol. xxi. p. 847.

[5] Lectures on the Parts concerned in the Operations on the Eye, p. 41; Lond. 1849.

[6] Edinburgh Medical and Surgical Journal; January, 1853; p. 32.

[7] See Jones's Ophthalmic Medicine and Surgery; p. 195; London, 1847: Roser, Op. cit. p. 10: Chelius, Handbuch der Augenheilkunde; Band ii. S. 381, Stuttgart, 1839.

[8] Beer's Ansicht der staphylomatösen Metamorphosen des Auges; Plate 1. figs. 1 and 2; Wien, 1805.

[9] Celsus de Re Medica; Lib. vii. Pars ii. Cap. i. Sec. 2.

[10] Lehre von den Augenkrankheiten; Vol. ii. p. 216; Wien, 1817.

SECTION XVI.—VARICOSITY OF THE EXTERNAL AND INTERNAL VESSELS OF THE EYE.

Two sets of blood-vessels belonging to the eye, are apt to be left in a state of varicose distension, after certain of the ophthalmiæ; namely, the recto-muscular arteries or their accompanying veins, and the vasa vorticosa of the choroid. The former are left in a varicose condition, chiefly after arthritic iritis; the latter, after choroiditis.

The extremely varicose twisting vessels, occurring on the eye, are conjunctival; the less varicose and straighter, are sclerotic. The former are larger, and of a darker red; and their undulating course is analogous to that of varicose veins.

Blueness of the attenuated sclerotica, in scrofulous sclerotitis and other ophthalmiæ, is in general quite independent of any varicose dilatation of the choroidal vessels.

Beer used to show a preparation, in which were seen what he considered varices of the vasa vorticosa, as large as small peas. After his death the preparation was examined, and the protuberances in question were found to be melanotic.

Little can be done, and nothing directly, to remove varicosity of the vessels of the eye, which is not only in general beyond cure, but affords an unfavourable index of the condition of the humours and retina. Glaucoma and amaurosis, in almost every case, are either already present, or are sooner or later developed, when the blood-vessels of the eye are affected with varicose distension.

I was consulted by a lady, who complained of an uneasy feeling in one of her eyes, on the surface of which ran a single large varicose vessel. The dyspeptic symptoms of the patient led me to prescribe the internal use of a mixture of columbo, rhubarb, and carbonate of soda. The belladonna collyrium was employed as an external application. By the use of these remedies, the symptoms were removed.

SECTION XVII.—ASTHENOPIA AND AMAUROSIS.

As I shall explain fully in a subsequent Chapter, asthenopia, or an incapability of sustaining the eye in a state of adjustment to near objects, is not an uncommon sequela of several of the ophthalmiæ.

Complete or incomplete insensibility to light is a frequent consequence of inflammation, especially when it has originated in the retina, or spread to it from the other internal textures of the eye, as, the choroid, or the iris. When the inflammation appears completely subdued, but the amaurosis continues, recovery of sight may be regarded as hopeless.

Syphilitic amaurosis is not unfrequent. Along with other secondary symptoms of syphilis, the patient has had iritis; this has been overcome by mercury, and the eyes look tolerably healthy; the lenses are transparent, and the consistence of the eyes is normal; but gradual loss of vision supervenes, and proves incurable.

SECTION XVIII.—OSSIFICATION IN DIFFERENT PARTS OF THE EYE.

Fig. Scarpa, Tav. II. *fig.* 8. Wardrop, Pl. XIV. Ammon, Thl. I. Taf. XVIII. Dalrymple, Pl. XXVIII. *figs.* 2, 3.

Ossification, or calculous deposite, is an occasional sequela of long-continued ophthalmia; and, indeed, it may be suspected that, in all instances, and in whatever texture of the body, abnormal formation of bone takes place, it is preceded by a certain kind or degree of inflammatory action. The crystalline body being dislocated, or the capsule of the lens being ruptured by an injury, may become the seat of osseous deposits, with the cornea clear, and the eye-ball of normal size; but, in general, those eyes in which parts are ossified, are atrophic, the cornea opaque and shrunk, or the iris and cornea staphylomatous. Eyes affected with malignant diseases, especially melanosis, frequently furnish ossifications on dissection.

Almost every texture of the eye has proved a seat of chalky deposite, or of ossification. Under the conjunctiva bulbi, in the cornea, sclerotica, iris, choroid, ciliary body, vitreous body, and crystalline body, such morbid changes have been met with. It is doubtful whether the retina has really been found in an ossified state; but a cup of bone between it and the choroid is not unfrequent.

Traumatic inflammation appears to be the most fruitful source of ossification in the eye. Inflammatory effusion taking place between the different tissues, or into their substance, is followed by chalky or ossific depositions. The choroid and the ciliary body, as Dr. Meyr has pointed out[1], are the chief sources of those internal exudations which proceed to the formation of bone. The deposits, in such cases, are in general not mere concretions, but are endowed with a certain degree of vitality. They are composed of true osseous tissue, and present traces of lacunæ under the microscope, but no Haversian canals.

§ 1. *Ossification of the Cornea.*

Voigtel[2] mentions, that in the Walterian Museum at Berlin, there was a piece of cornea preserved, which had been converted into bone. It was three lines long, two broad, and weighed two grains.

Chelius[3] states, that in leucomata of old standing it is not uncommon to find depositions of phosphate of lime. In the centre of an albuginous cornea of a soldier who had suffered from Egyptian ophthalmia, D'Arcet found, on dissection, a very hard brittle ossification, about the size of a lentil, which implicated the whole thickness of the part, and projected slightly towards the crystalline. The other textures of the eye were healthy.[4]

In dissecting an eye of which no history could be obtained, Mr. Wardrop[5] found gritty particles and inequalities on the internal surface of the cornea.

§ 2. *Osseous Deposite in the Sclerotica.*

Schön[6] refers to a case, related by Blasius, in his *Observationes Medicæ Rariores,* in which an ossified lamina was found in the sclerotica.

§ 3. *Osseous Deposite in the Anterior Chamber.*

Mr. Wardrop mentions a case which had come under his observation, in which thin laminæ of bone were discharged at several times, from the anterior chamber, through ulcers formed in the cornea.[7]

§ 4. *Ossification of the Iris.*

Schön[8] refers to two cases of this sort which had occurred to Walter; in one of which both eyes were affected, the iris in each forming a cone, three lines long, connected by its apex to the capsule of the lens. A case, which occurred to Benedict, in a carcinomatous eye, is referred to by Dr. Meyr.[9] Mr. Wardrop had an opportunity of examining a case, under Mr. Wishart's care, where, he says, that portion of the capsule of the aqueous humour, which is reflected over the iris, was almost entirely converted into a bony shell.[10]

§ 5. *Ossification of the Corpus Ciliare.*

Praël[11] found the whole ciliary body ossified in an eye, which had been disorganized and become atrophic from the pressure of an encephaloid tumour in the orbit.

§ 6. *Ossification of the Choroid.*

Voigtel has described various preparations belonging to the Walterian Museum, in which the choroid was more or less completely ossified. In one, the posterior half was so affected; in others, the anterior part; in some, the whole choroid. He also quotes from Günz, an instance of ossification, described as being between the lamellæ of the choroid.[12]

In a preparation of coarcted retina, now before me, and which I owe to the kindness of Mr. Norris, late of the Glasgow Royal Infirmary, the choroid is partially ossified. The eye was atrophic, and the cornea opaque.

Two remarkable cases of sudden loss of vision are related[13], the one by Ammon, and the other by Unger, in which, the cornea remaining clear, the iris appears to have shrunk so much as scarcely to be visible, while the lens, become opaque, retreated into the vitreous chamber, so as to allow a white opacity to be seen around it and beyond it, which was ascribed to ossification of the choroid, but was probably owing to opacity and coarctation of the retina.

§ 7. *Ossification between the Choroid and the Retina.*

Morgagni, Morand, Haller[14], and others, have recorded instances of cup-like ossifications within the choroid. Ossifications in this situation have generally been regarded as situated in the retina. The retina, however, is rarely, if ever, affected in this way; but is generally found entire within the ossified cup, or gathered together into the form of a cord. The calcareous matter is most probably deposited in a false membrane formed in consequence of exudation from the choroid, conformably to Panizza's opinion, that fluids, extravasated between the membranes of the eye, in consequence of inflammation, are capable of depositing calcareous crusts.

Morgagni says, that in the case which fell under his observation, instead of the retina, there was a thin bony lamella under the choroid universally.[15]

Case 609. — In Morand's case, both surfaces of the retina appear to have been enveloped by the osseous substance. The patient had been blind of the eye thus affected for 20 years; when about 15, he had a violent inflammation of that eye, followed by yellow cataract, which several oculists had offered to remove by operation, but the patient would never consent.

Case 610. — In Haller's case, the osseous cup adhered to the choroid, while the retina, gathered into a cord, passed forwards, and surrounded the crystalline, which was also ossified.

Mr. Wardrop mentions that he had met with a few instances of a thin cup of bone between the sclerotic and the retina; that the retina was in immediate contact with the interior surface of the bone, but that between the sclerotic and the ossification there was a very thin, tender, and pale-coloured membranous expansion, the only vestige of the choroid; and that at the bottom of the cup, there was a small round perforation, through which the retina passed to expand on the interior surface of the osseous shell.[17]

Cloquet's case, one of the most accurately described, is as follows: —

Case 611. — The eye was taken from the dead body of a man aged about 50. The cornea and iris were staphylomatous; the eye more voluminous than natural, and longer in its transverse diameter than in any other. On being pressed between the fingers, it resisted sufficiently to show that its membranes were sustained interiorly by some solid body. The sclerotica presented nothing particular; nor did the optic nerve, which retained its natural size and organization. The choroid had the ordinary appearance, with its vessels injected. The ciliary ligament had almost entirely disappeared. The iris, in a deformed state, adhered to the posterior surface of the cornea, as did the crystalline lens, which was atrophic and of an irregular form. The aqueous humour had disappeared; the vitreous was very limpid and fluid. The internal surface of the choroid adhered slightly to a very thin osseous shell, formed by the deposition of calcareous granulations into the substance of what Cloquet conceives to have been a false membrane, existing between the choroid and retina. (*Fig.* 68.) The shell had no adhesion to the retina. It had a round opening for giving passage to the optic nerve. Posteriorly it was pretty thick, but anteriorly very thin, and ended with an irregular fringed edge. It presented on different parts of its extent, small irregular openings, closed by a fine transparent membrane, in the substance of which were observed many white delicate granulations, not yet united into osseous laminæ. The retina examined under water, presented no visible alteration in its organization.[18]

Case 612. — Panizza examined the eye of a man of 60 years of age, who had lost the sight of it in his youth, from internal ophthalmia. The cornea was completely opaque, and flattened. The sclerotica was natural in form, but somewhat less in size, and hard to the touch. The sclerotica being divided circularly, and the choroid raised, a white, hard, stony substance, somewhat rough, came into view. After the eye had been left in alcohol for two days, the dissection was continued. On reversing the anterior segment of the sclerotica and choroid, the calcareous substance was found to be present under the whole of the latter membrane. The iris adhered firmly to the internal surface of the cornea, and to the lens, which was shrunk and ossified. The posterior segment of the sclerotica and choroid was easily reversed, there being almost no connections between the parts, except by means of some vessels which passed into the calcareous substance lying beneath. These attachments being separated, Panizza noticed that the whole calcareous mass hung from the optic nerve, which penetrated by an opening into its interior. Desirous of ascertaining the state of the retina, he cautiously removed a portion of the calcareous substance. He found the calcareous shell very resisting on its external surface, although brittle, about a line in thickness, and formed of strata, of which the innermost were the least hard, and at last almost membranous. Having thus penetrated to the cavity of the shell, he found it filled with a whitish substance, albuminous, of the consistence of jelly, and arranged in strata, which became softer and softer towards the centre of the eye, and which he compares to the layers contained in an aneurismal sac. He removed a part of this substance, and saw in the middle of it the retina, in the form of a membrane which had been gathered together. Passing from behind forwards, it terminated anteriorly by attaching itself, in an expanded state, to the posterior margin of the corpus ciliare, while its slender posterior extremity corresponded to the entrance of the optic nerve through the sclerotica. On making a vertical section of the conical portion of the retina, Panizza found within it the hyaloid membrane, corrugated, and reduced to a very small mass, along with a little of the vitreous humour. Raising the flaps of the divided retina, he found its internal surface smooth, and not at all adherent to the hyaloid.[19]

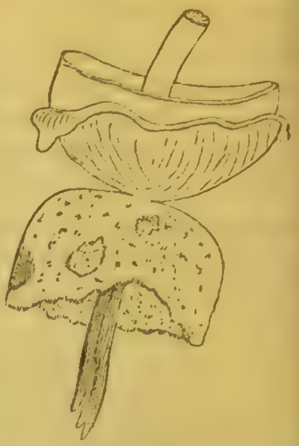

Fig. 68.

Reasoning from this dissection, Panizza rejects the notions of those who have attributed such states of the eye to ossification of the hyaloid or of the retina, and adopts the opinion, already noticed, that such calcareous incrustations arise from the condensation of extravasated fluids.

§ 8. *Ossification of the Hyaloid Membrane, Crystalline Capsule, and Crystalline Lens.*

Many examples have been recorded of ossification of the crystalline lens and capsule; and in some of these, the hyaloid membrane has been more or less affected in the same manner.

Case 613. — Spree, in his thesis, records a case in which, after the extraction of a cataract, the operation having failed in restoring sight, the patient was affected with pain in the eye till the time of his death. On dissection, morbid adhesions were found between the choroid and the neighbouring parts; there was no trace of the retina; the optic nerve was atrophied; and in place of the vitreous body, there was a bony substance, convex posteriorly and concave anteriorly, and half an inch in thickness.[20]

"In one case," says Mr. Wardrop, "besides the capsule of the lens being ossified, I found several large, but thin scales of bony matter, dispersed in an irregular manner throughout the vitreous humour, which, in all probability, were ossifications of the hyaloid membrane."[21]

In a case of capsular cataract, I found the anterior hemisphere of the capsule hard and gritty under the needle. The disease had originated in iritis, followed by contracted pupil and lymphatic exudation. The cataract was depressed, and a tolerable share of vision was restored.

The anterior hemisphere of the capsule is more frequently ossified than the posterior. In some cases, the whole capsule is converted into a thin shell of bone, containing the lens in an opaque state. In other cases, the lens has been previously absorbed, in part or completely, so that the ossified capsule has a less regular form, having become shrivelled before being converted into bone.

In an eye sent to Mr. Wardrop by Mr. Allan Burns, the central portion of the lens was found converted into hard bone. This was the only instance which Mr. W. had met with, in which ossification of the lens was unattended by ossification of the capsule. The ossified centre of the lens was of a deep brown colour, and exhibited a laminated structure.[22]

The lens, dislocated either into the vitreous humour, or into the anterior chamber, in consequence of a blow on the eye, is very apt to become ossified. In those cases, where a lens, inclosed in a ruptured capsule, comes into the anterior chamber and is left there till the lens nearly disappears by absorption, its place seems always to become partially occupied, either by amorphous calcareous deposite, or by a layer of ossific matter within the capsule.

When a lens, inclosed in its capsule, has been separated from its suspensory ligament, and falling back into the vitreous humour, reduced to a state of synchysis, has become ossified, it is apt to come forward through the pupil, when the patient happens to stoop, and if not extracted, gives rise to iritis.

Case 614.—Pellier[23] relates a case, in which the cornea of an eye which, for 20 years, had suffered more or less from inflammation, at length gave way, and allowed an ossified lens to be seen and felt. A crucial incision was made through the cornea, and a portion of calculous substance, of the size of a kidney-bean, was extracted. Part of the ossification was still left in the eye, the patient having become so restless that it could not be removed. Pellier seems to think that the whole contents of the eye were in an ossified state. The piece extracted was rough and irregular.

Case 615.—Though Mr. Wardrop gives the following case, communicated to him by Mr. Anderson, surgeon at Inverary, as one of a piece of bone formed in, or immediately behind the cornea, I cannot help suspecting it to have been merely a dislocated lens and capsule, which had become partially ossified in the anterior chamber.

On examining the right eye of a woman of 31 years of age, Mr. Anderson observed a substance of a whitish appearance, arising from the inside of the sclerotic coat, and extending upwards behind the cornea, over a great part of the iris to very near the pupil. It had produced much irritation in the eye, with inflammation, severe pain, an almost constant flow of tears, inability to bear the light, and a considerable diminution of vision. The eye was less in size than the other. The complaint was the consequence of a fall, 15 years before, at the root of a tree, by which the patient struck the eye, but did not cut any part of it. From this period, the substance seen through the cornea, had begun to grow, and had gradually increased in size. The pain and other symptoms had been sufferable until about nine months before

Mr. Anderson saw her, when the complaint became more violent. He made an incision into the cornea, in the manner recommended for the extraction of the cataract, raised the flap of the cornea with a flat crooked probe, and with the same instrument turned out a small piece of bone. The upper part of it was as thin as a piece of paper; at the under part it was thicker, porous, and brittle, and of an irregular semilunar form. The upper part was quite detached, the under part slightly adhered to some part of the globe out of sight; but it was easily extracted, without requiring the knife to separate its adhesions. From the unsteadiness of the patient, it was impossible to discover from what part the ossification originated.[24]

On extracting a ruptured capsule which lay in the anterior chamber, I found a quantity of amorphous calcareous deposit within it, of a brownish colour. I have extracted several lenses, which had become ossified in the vitreous humour, and had slipped forwards through the pupil. The surface of the ossification was always irregular and porous, and generally closely embraced by the transparent capsule. In one case, the whole interior of the capsule was coated by a pretty thick layer of bony substance, of a nodulated appearance. On examination, the nodules were found to consist of what appeared to be cartilage, inclosing masses of carbonate and phosphate of lime, and surrounded by new membranous substance which had formed within the capsule.[25] Although extraction is the best practice to follow in such cases, the patient may sometimes be temporarily relieved by lying supine with his head low, and having the pupil artificially dilated, so as to allow the ossified lens to gravitate into the vitreous humour; or should this fail, by having a curved needle passed through the sclerotica, with which the lens may be carried back through the pupil.

Cretaceous degeneration of the lens or its capsule, even when these textures maintain their natural situation, not unfrequently produces pain and irritation, both in the diseased eye, and, sympathetically, in the sound one, requiring the cornea of the diseased eye to be opened, and the ossified parts to be extracted; or if the cornea is opaque and adherent to the iris, part of the cornea to be excised, and the ossified lens or capsule removed with forceps.[26]

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[1] Beiträge zur Augenheilkunde; p. 34; Wien, 1850.

[2] Handbuch der pathologischen Anatomie; Vol. ii. p. 92; Halle, 1804.

[3] Ueber die durchsichtige Hornhaut des Auges, p. 56; Karlsruhe, 1818.

[4] Journal Hebdomadaire de Médecine; 19 Septembre, 1829, p. 482.

[5] Morbid Anatomy of the Human Eye; Vol. i. p. 74; London, 1819.

[6] Zeitschrift für die Ophthalmologie; Vol. iv. p. 64; Leipzig, 1854.

[7] Ibid., Vol. ii. p. 18; London, 1818.

[8] Op. cit. p. 66.

[9] Op. cit. p. 26.

[10] Op. cit. Vol. ii. p. 18.

[11] Ammon's Monatsschrift; Vol. i. p. 482; Leipzig, 1838.

[12] Op. cit. Vol. ii. p. 97; Halle, 1804.

[13] Zeitschrift für die Ophthalmologie; Vol. i. p. 319; Dresden 1831.

[14] Halleri Opuscula Pathologica; p. 136; Lausannæ, 1755.

[15] De Sedibus et Causis Morborum; Epist. lii. Art. 30.

[16] Mémoires de l'Académie Royale des Sciences, pour 1730; p. 467; Amsterdam, 1733.

[17] Op. cit. Vol. ii. pp. 68 and 272; London, 1818.

[18] Pathologie Chirurgicale, par Jules Cloquet, p. 130; Pl. x. figs. 1 and 2; Paris, 1831.

[19] Panizza, Appendice sul Fungo Midollare dell' Occhio; p. 22; Tav. i. fig. 7; Pavia, 1826.

[20] Annales d'Oculistique; Tome xiv. p. 122; Bruxelles, 1845.

[21] Op. cit. Vol. ii. pp. 128 and 271; Pl. xiv. fig. 2; London, 1818.

[22] Ibid. pp. 96 and 261; Pl. xi. fig. 5.

[23] Recueil de Mémoires et d'Observations; Obs. 139; Montpellier, 1783.

[24] Op. cit. Vol. i. p. 75.

[25] See case of extraction of an ossified lens; by France, Guy's Hospital Reports, Second Series; Vol. iii. p. 197; London, 1845.

[26] See cases by Walton, Medical Times and Gazette, February 18, 1854, p. 155.

CHAPTER XV.

ADAPTATION OF AN ARTIFICIAL EYE.

Syn. — Ocular prothesis.

It would appear[1], that in former times, when the eye and eyelids had been destroyed, or removed in consequence of disease, a painted imitation of these parts was sometimes applied over the front of the orbit, and kept in its place by means of a steel-spring going round the temple to the opposite side of the head; but, at the present day, by an artificial eye is generally meant a hollow semi-ellipse or hemisphere of enamel, coloured to resemble the front of the natural eye, and introduced behind the eyelids. Enamelled plates of gold were at one time used for this purpose, but artificial eyes are now made altogether of enamel and glass.

An artificial eye ought to be perfectly smooth, and of such a form and size as to cover the remainder of the natural eye without pressing much on it, or irritating it in any way. Its edge ought not to be sharp, but somewhat thick and round. The internal surface of the middle portion, which represents the cornea, ought to be concave, or at least flat, and not, as we sometimes find it, convex, which form must necessarily give rise to pressure on the eye, unless it be much shrunk. Want of attention to these particulars is often the cause of the pain which patients feel from the introduction of an artificial eye, and which often leads them to resign all thoughts of continuing its use.

Artificial eyes have generally been made of a semi-elliptical shape, or like the half of the shell of an egg cut lengthwise; but of late a shallower form, approaching to the hemispherical, has been adopted, as less likely to pinch the bulb on which the eye is placed, irritate the conjunctiva, cause an appearance of strabismus, or prevent the movements of the artificial eye.

Thinness and lightness are indispensable requisites of an artificial eye. When the eye to be covered is large, unless the artificial eye is thin, the lids are too much pressed out, and are prevented from executing their usual movements.

When the remains of the eye are irregular in form, it has been proposed to make the artificial eye so too, lest it should press unequally and injuriously against any part. When one or other eyelid, for example, is partially adherent to the remains of the eyeball, unless the adhesion is removed by an operation, the diameter of the artificial eye from above downwards must be shorter than common, or have a notch in its edge opposite to the point of adhesion.

The particular hue of the white of the eye, the appearance of the vessels strewed over it, and the size and colour of the iris, ought to be imitated from the sound eye, although certainly these are considerations much less important than that the artificial eye should be of a fitting size and form. The pupil ought to be represented at its medium degree of expansion, and the appearance of an anterior chamber ought to be given. The iris always looks darker, when the eye is introduced behind the eyelids, than it does when examined in the hand.

The manufacture of artificial eyes is very simple.[2] The part imitating the sclerotica is formed of white enamel, with a tinge of yellow. The posterior lamina of the central piece is coloured and streaked to look like the iris; on the middle of this lamina a circular patch of black enamel is laid, to imitate the pupil; the superficial lamina is transparent glass. Threads of red enamel are spread over the surface in imitation of blood-vessels, and are melted in before the blow-pipe.

If the defective eye, which the patient is desirous of covering from view, is not larger than the natural size, an artificial eye may be worn without any previous surgical operation, but if there is a total staphyloma of the cornea and iris present, this must first be removed. The effects of any injury which has rendered the application of an artificial eye desirable, or of any operation which has been performed on the eye, must first be completely cured, and an additional space of some months must have elapsed, before the artificial eye can with propriety be tried. In some cases, indeed, from the great irritability of the patient, causing a tenderness and epiphora which cannot be subdued, or from the nature of the disease in which the loss of the eye took place, giving ground to dread lest irritation might excite some malignant affection, we are obliged to resign thoughts of applying an artificial eye.

The protrusion of a portion of iris, or a staphyloma racemosum, sometimes renders the wearing of a glass eye impossible, from the pain which is produced, till the protrusion is removed. If there is a prominent partial staphyloma at the upper or lower part of the cornea, the ordinary oval glass eye will not lie lengthways, as it ought to do, but turn round, so that its nasal end is down and its temporal end up. In this case, a hemispherical glass eye is more likely to answer.

In cases of eversion of the lower lid, the eversion may require to be cured by operation, before any glass eye can be applied.[3] Symblepharon will require similar interference. If the eye-ball has been extirpated, the sinuses of the conjunctiva are so much obliterated, that there remains no seat in which an artificial eye may rest.

If there is no inflammation, no fungous excrescence from the eyeball or eyelids, no pain or irritation present, an artificial eye may be tried. The mode of introducing it is to lay hold of it by its lower edge with the thumb and forefinger of the right hand, moisten it, with the left thumb raise the upper eyelid, under which introduce the upper edge of the artificial eye, pressing it up into the upper sinus of the conjunctiva, till its most prominent part is hid; then to allow the upper lid to descend. The artificial eye is now to be supported with the right thumb, while with the left forefinger the lower eyelid is to be drawn downwards, which allows the artificial eye to slide behind it into the lower sinus of the conjunctiva. If the edge of the artificial eye does not reach the sinus, but rests on the tarsus, it is too large, and a smaller one must be selected.

For some days, the eye is to be worn only during a few hours. It is withdrawn with the aid of a gold or silver probe, of the thickness of a knitting-needle, the end of which is rounded off and bent into the form of a hook. With the forefinger of the left hand the lower lid is to be depressed, so as to allow the hook to be introduced behind the edge of the eye, which by this means is to be raised till it is no longer grasped by the lower lid; the eye immediately glides from under the upper eyelid, and is to be laid hold of by the left hand. The eye is to be immediately freed from the mucus which adheres to it, by rubbing it gently with a bit of soft rag, and then laid aside till next day. It ought not to be plunged into cold water, as this is apt to make it crack. If imperfectly annealed, artificial eyes are apt to crack, merely from the alternations of temperature to which they are exposed, when withdrawn in the evening, or replaced in the morning.

The patient is soon able to introduce and withdraw the eye without assistance. While withdrawing it, he leans over a bed, or over a table with a towel spread on it, in order that, if it should fall, it may not be broken.

If the eyeball has shrunk to a small size, the eyelids lose that support and elasticity necessary for the performance of their motions; the consequence is, that they soon become entirely motionless, and sink into the orbit, while the cilia are inverted, and the sinuses of the conjunctiva, which in the natural state of the parts extend between the eyeball and the eyelids, gradually become contracted, and at last almost abolished. The superabundant tears and mucus cannot be properly excreted, being no longer pressed forward by the convexity of the eyeball, but gather behind the lids and adhere to their edges and angles, while the nostril of the same side feels dry. These symptoms are in general greatly lessened by the use of an artificial eye, which affords to the lids a new support, restores to them the elasticity necessary for their motions, and expands again the folds of the conjunctiva; while the renewed action of the lids serves to convey the tears and mucus to the puncta lacrymalia, as in the state of health. In such cases, it is sometimes necessary to commence with a small artificial eye, and employ larger ones, proportionally as the folds of the conjunctiva will admit. We need not be afraid that a small eye will, in such circumstances, fall out from between the lids; for we may observe that the lids are enabled to open only in proportion to the size of the eye which is placed behind them.

We may begin with the use of a small plain eye; by which I mean one without any representation of the iris. A series of such eyes ought to be kept by the oculist, and employed till the patient becomes accustomed to their use. The lids cannot in general be easily moved at first over an artificial eye, so that it remains exposed to the foreign matters driven through the air, and both from this cause, and from the first attempts of the patient to remove and replace it, is apt to become scratched, which very soon destroys its appearance. Every two or three days, a larger eye ought to be introduced, till at length the lids shall appear to have reached nearly their natural degree of expansion.

The iris and pupil of the eye which is to be used permanently must correspond in direction with those of the sound eye, and must not be placed nearer to either canthus than they are in it, else the patient will appear to squint with the artificial eye. Some artificial eyes are made for the right or left side only, and have more sclerotica above than below the iris, others are intended to be used on either side, and have the iris placed midway between the upper and lower edges of the eye. In all artificial eyes there is more sclerotica on the temporal than on the nasal side of the iris.

A properly adapted artificial eye performs the same motions as the sound eye, especially if the remains of the eyeball over which it is placed are considerable, and are moved with facility by the recti. The motion of the artificial eye, however, does not depend upon this alone, but also on the motion of the conjunctiva and its folds, into which the artificial eye is received, and which possess a simultaneous movement with the eyeball and eyelids. Hence it is that, if the artificial eye is of a proper size, neither so small as to escape the grasp of the conjunctiva, nor so large as to prevent its influence, we find that it performs all the ordinary motions of the eye, even when the stump which is covered is very small.

An artificial eye soon begins to suffer from the friction of the eyelids, and the effect of the tears and mucus, so that the cornea becomes dim from the glass losing its polish. It has been supposed that it is the Meibomian secretion which is chiefly detrimental. The polish is never completely preserved for longer than three or four months; and generally in six months the whole surface of the eye is hazy and slightly rough. The red threads, imitating blood-vessels, sometimes dissolve entirely, leaving grooves, before the cornea or sclerotica becomes altered. The rapidity with which this process goes on varies, depending on the peculiar qualities of the secretions of the individual. Their speedy waste, along with their extravagant price, puts it out of the power of any but those in easy circumstances to use artificial eyes; although many persons in indigent circumstances, finding it difficult to obtain certain kinds of employment from loss of an eye, are desirous of wearing an artificial one. They must often submit, however, to conceal their defect behind dark-coloured glasses, or if the appearance of the lost eye is very unsightly, to cover it with a hollow shade. They ought never to adopt the practice of covering it up closely with a patch, which heats the parts too much, and renders them inflamed and œdematous.

Enamel eyes which have lost their polish, prove hurtful, their roughness exciting the conjunctiva to inflammation, excoriation, and the growth of fungous excrescences. When an artificial eye, therefore, is observed to have become dim, and to be producing irritation, it must no longer be used, any irritation already present must be calmed, and when the parts are again perfectly free from pain or inflammation, a new artificial eye, or the old one repolished, may be applied.

When we wish an artificial eye made expressly for any particular person, it is necessary to send to the enameller a drawing of the sound eye, representing accurately the colour and other appearances of the iris, along with a model in wax or lead of the size and form of the artificial eye which is to be made, taking the convexity of the model from the sound eye, and marking on it the place and size of the iris and pupil, and the extent of sclerotica exposed when the eye is moderately open. The drawing and model ought to be kept by the enameller, so that at any future time the patient can have an eye made after them and sent to him, without further trouble.

In the use of an artificial eye, the strictest regard to cleanliness must be observed. Every 12 hours, it must be taken out, and freed from the mucus which adheres to it and accumulates in its cavity. The eyelids must at the same time be bathed with tepid water, and should there be any considerable relaxation of parts, or tendency to puro-mucous inflammation, a slightly astringent collyrium is to be employed, and the edges of the lids smeared with a little red precipitate salve. Should the conjunctiva appear swollen or fungous, it is proper to touch it with a lunar caustic solution. Sometimes it is necessary to snip away hard fungous folds of the conjunctiva. This must be done cautiously, lest the sinuses be rendered too contracted to hold the artificial eye, or adhesions form between the eyelids and the eyeball.

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[1] Œuvres d' Ambroise Paré ; Liv. xxiii. Chap. 1.

[2] On the manufacture of artificial eyes, see Blancourt's Art of Glass ; Translated into English; p. 353; London, 1699.

[3] See case of adaptation of an artificial eye, where an injury to the integuments of the cheek had produced ectropium, combined with loss of eyeball; by Walton; Medical Times and and Gazette; January 29, 1853; p. 117.

CHAPTER XVI.

PARTIAL AND GENERAL ENLARGEMENTS OF THE EYEBALL; EFFUSIONS AND TUMOURS WITHIN ITS COATS.

SECTION I.—CONICAL CORNEA.

Syn.—Ochlodes, *Taylor*. Staphyloma pellucidum conicum, *Lyall*. Hyperkeratosis, *Himly*.

Fig. Demours, Pl. LVII. *fig.* 1. Ammon, Thl. I. Taf. III. *figs.* 13—21. Taf. X. *fig.* 8. Thl. III. Taf. VII. *figs.* 8—10. Dalrymple, Pl. XXXII. *fig.* 1. Sichel, Pl. XXXII. *figs.* 3—6.

In this affection the cornea, instead of its natural shape, presents the form of a cone, more or less acute. Viewed in profile, the cornea in this state looks like a drop of water, or like a solid piece of glass, projecting from the front of the eye. (*Fig.* 69.) On placing the patient directly opposite to a window, and viewing the eye in front, the centre of the cone so reflects the light as to produce a sparkling effect. The cone, in some cases, is small and pointed ; in others, although it projects more, its apex is rounded off. The apex of the cone is generally in the centre, but sometimes towards one side of the cornea. In some cases, the whole cornea partakes of the conical form ; in other instances, the cone is small in comparison to the whole extent of the cornea, and rises rather abruptly. In certain positions of the eye, the point of the

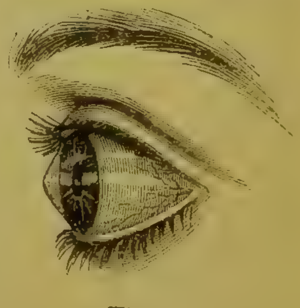

Fig 69.

cone appears less transparent than the rest of the cornea, and not unfrequently it is actually nebulous or opaque.

In slight cases, conical cornea may pass without being detected, till the observer examines the form of the image of the window, or of a candle, reflected from the surface of the cornea. The image is so remarkably changed in shape, and becomes so suddenly small, when it comes upon the apex of the cone, as at once to show that the cornea has lost its spherical form.

In the earliest period of the disease, short-sightedness is the principal effect which it produces on vision; when more advanced, nothing is seen by the patient through the centre of the cornea; all the sight which he enjoys is either over the nose, or towards the temple, and in its sphere is extremely limited. Still, however, by strongly compressing the eye with the half-closed lids, or with the finger, so as to limit the pupil, and bringing the object close towards one or other side of the eye, generally towards the temporal, the patient is sometimes able even to read. Beyond two or three inches, vision becomes very indistinct, and at a few feet the patient, in general, distinguishes absolutely nothing; he can judge neither of the distance nor form of objects, so that he is rendered nearly as dependent as if he were blind. It is often the case, that the first symptom complained of, is dimness of sight; and unless the eye is carefully examined, amaurosis may be supposed to be present.

In its natural state, the cornea has no surface large enough to bend more than a single ray of light, and it aids in concentrating all the single rays into one place, there to form a vivid image of external objects; but in the disease now under our consideration, it presents inequalities, each of which, like a facette of a multiplying glass, bends a set of rays, capable of forming a separate image. Hence it is generally the case, that objects appear multiplied to an eye affected with conical cornea.

Case 616.—One of Mr. Wardrop's patients observed that, when she looked at a candle, it was multiplied five or six times, and that all the images were more or less indistinct. When Sir David Brewster examined her eye, he observed that, in every aspect in which the cornea could be viewed, its section appeared to be a regular curve, increasing in curvature towards the vertex. As the disease was evidently seated in the cornea, which projected to an unnatural degree, it did not seem probable that there was any defect in the structure of the crystalline lens. He was, therefore, led to believe, that the broken and indistinct images, which appeared to encircle luminous objects, arose from eminences on the cornea, which could not be detected by a lateral view of the eye, but might be rendered visible by the changes which they would produce upon the image of a luminous object traversing the surface of the cornea. He, therefore, held a candle at the distance of 15 inches from the cornea, and, keeping his eye in the direction of the reflected rays, observed the variations in the size and form of the image of the candle. The reflected image regularly decreased in size when it passed over the most convex parts of the cornea; but when it came to the part nearest the nose, it alternately expanded and contracted, and suffered such derangements as to indicate the presence of a number of spherical eminences and depressions, which sufficiently accounted for the broken and multiplied images of luminous objects.[1]

Sir David Brewster afterwards examined various cases of conical cornea; and, in all of them, detected inequalities in the superficial conformation of the cornea.

It was long a doubtful point, whether the cornea was merely protruded into the conical form which it assumes, or actually thickened, and the cone solid. The external appearance might certainly lead us to think that the latter was the case; and accordingly Sir William Adams described[2] the disease as a morbid thickening and growth of the substance of the cornea, while Himly gave it the name of *hyperkeratosis.* Mr. Wardrop, however, states that the irregular portion at the apex of the cone, which is sometimes clouded and opaque, is generally very thin; and that in one case, a gentlemen with this disease receiving a blow in the eye, the cornea burst. This view of the matter has been confirmed by Dr. Jäger, of Erlangen, who, on dissecting the eyes of a person affected with conical cornea, found the apex of the cone very thin, but the circumferential portion of the cornea thickened.[3] So thin is the prominent part that, on puncturing the cornea in this disease, the gush of aqueous humour allows the cone to collapse and become wrinkled.

The disease begins first in one eye, and after a time attacks the other also. In general, the one continues much more affected than the other. It has been met with in almost every stage of life; like common myopia, it appears most frequently about the time of puberty, or at least advances rapidly about that period, so that the patient is perhaps obliged, on account of extreme shortness of sight, to give up the trade he had already learned. In one instance, Mr. Wardrop met with it in a boy of 8 years of age. Sir W. Adams had seen it in patients from 16 to 70; much more frequently, however, in women than in men, and in young than in old persons. Dr. Ammon states[4] that conical cornea is sometimes congenital. He once met with it in several sisters, who laboured under it from birth.

The progress of conical cornea is in general unattended by inflammation, pain, or feeling of distention. I have known it, however, to be preceded by headache and pain in the eye, for a considerable time. I have seen conical cornea associated with scrofulo-catarrhal ophthalmia, with common specks of the cornea, and with pterygium. I have also known it to arise from corneitis. When this is the case, the cone embraces the whole of the cornea; the form is that of a sugar loaf, somewhat as in Demours' figure, and the apex is rounded, not pointed. When not preceded by corneitis, the cone is more acute, does not affect the whole extent of the cornea, and tends often to one or other portion of its margin. In one case, which I saw, conical cornea followed scarlatina. In a lad at the Glasgow Eye Infirmary, a blow on the eye with a snowball was supposed to have led to it. Much weeping has sometimes been blamed for it.

It is not likely that this disease depends on any abnormal pressure by the aqueous humour. More probably it is an effect merely of faulty nutrition of the cornea. It probably begins in all cases with thinness of that portion of the cornea, which afterwards becomes prominent. I have a suspicion that it sometimes arises from the thinning of the cornea attending a transparent cicatrice or dimple. In a young lady, for whom I was consulted, it followed haziness of the cornea, and one or two small depressions, such as are left after the absorption of phlyctenulæ.

Treatment.—I have never known conical cornea lessened by any remedy, internal or external. The treatment should have for object to prevent, if possible, the progress of the disease, and ward it off from the other eye, if only one is affected. This will be best accomplished by avoiding every employment which causes straining of the sight, by exercise in the open air, attention to the bowels, and tonics, such as quina.

It is generally agreed that evacuation of the aqueous humour is of no use. In a case, however, which I saw, I was led to believe that an accidental giving way of the cornea was followed by a considerable improvement. The patient was a young lady who, several years after consulting me, suddenly, on stooping, felt as if her eye was giving way, and immediately the cornea was observed to present a milky appearance. This was gradually removed, and the form of the cornea became nearly natural.

Pressure, astringents, and all other local means, appear to have failed in arresting the progress of conical cornea. M. Desmarres, however, has some faith in pressure, which he says should be light, applied with exactness, and long continued. It should be immediately preceded by puncture of the cornea.[5]

Mr. Travers says he has found repeated blisters, and the more powerful tonics, as steel or arsenic, decidedly serviceable.[6] As it is evident, however, that he confounds conical cornea with aqueous dropsy[7], it is impossible to know whether the benefit accruing from these remedies, occurred in the former, the latter, or both of these diseases.

Dr. Pickford recommends emetics and purgatives, which, he thinks, by their influence on the gastric and other nerves, restore the healthy functions of the weakened nutrient and absorbent vessels of the cornea. The result, he says, is a slow, but progressive retraction of the cone, and a consequent restoration of vision.[8]

Sir David Brewster states, that the injurious effects of this disease upon vision may, within certain limits, be removed by glasses, and by preventing the image from being formed by rays passing through any part of the corrugated surface of the cornea, such as he discovered in Mr. Wardrop's case. Very deep concave lenses produce a considerable effect in rendering objects distinct.

The patient also sees better when his eyelids are all but shut, and the confusedness of vision is greatly lessened by his looking through an opening of the size of the pupil, formed in a piece of black wood. This affords more aid in correcting vision than any form of lens. The two means, however, are not incompatible; namely, a deep concave lens, with a movable diaphragm behind it, attached by a hinge to the spectacle frame in which the lens is fixed. The diaphragm may have either a hole in the middle, or a narrow transverse slit This contrivance may be tried with or without artificial dilatation o the pupil.

Sir John Herschel suggests, as worthy of consideration, in very bad cases of irregular cornea, whether at least a temporary distinc vision could not be procured, by applying in contact with the surface of the eye, some transparent animal jelly contained in a spherica capsule of glass; or whether an actual mould of the cornea migh not be taken and impressed on some transparent medium. "The operation," says he, "would, of course, be delicate, but," referring here to extraction of the cataract, "certainly less so than that of cutting open a living eye, and taking out its contents."[9] There would be no great difficulty in taking an impression of the eye, and of forming a concavo-convex lens, the hollow surface of which should correspond to the conical form of the cornea; but though such a lens might be applied for a few seconds, it could not be borne in contact with the eye sufficiently long to serve any useful purpose.

Dr. Hull mentions[10], that in as bad a case as he ever saw, most benefit was received through an instrument formed of two lenses, with an adjustment, the object-glass large and convex, the eye-glass smaller and doubly concave, an arrangement similar to that of an opera-glass.

Sir W. Adams, from the opinion which he had adopted, that the conical form assumed in this disease was the effect of a morbid growth of the cornea, and that the short sight of the patient was to be attributed to the increased refractive power of the part, which, together with that of the crystalline lens, brought the rays of light to a point far short of the retina, suggested, that as it was impossible to remove the morbid state of the cornea, without rendering it unfit for the transmission of light, a useful degree of vision might be restored by removal of the crystalline lens. His opinion in favour of this plan was confirmed by what happened in the case of a woman of nearly 70 years of age, who placed herself under his care, labouring under this disease accompanied with cataracts. These he successfully removed, and had the gratification to find that the patient was capable of seeing much more distinctly without convex glasses than it is usual for those to do who have undergone the operation for cataract.

The result of this case determined him, at the earliest opportunity, to try the effect of removing the crystalline lens, as a remedy for the blindness produced by conical cornea. A favourable case presented itself the following year: —

Case 617. — A young woman, who, during six years had found her sight gradually decreasing, at the expiration of that period became so blind, as to be unable to continue her employment as a servant. The cornea of each eye had assumed the conical form in a great degree, attended by a slight opacity in the apex of each cone, but none whatever in the crystalline lens. She could walk without a guide, and could see at the distance of three or four feet, so as to avoid running against any person, but had entirely lost the power of reading or perceiving minute objects, however near to the eyes. Sir William effected the removal of the crystalline lens of one of her eyes, by the operation of division. The patient, however, returned to the country before the eye had entirely recovered from the operation, and Sir William did not again see her until nearly 12 months afterwards, when he was gratified to find her capable of discovering minute objects, and reading the smallest sized print, without the assistance of a glass, while holding the book at the usual distance of 10 or 12 inches from the eye. The usual cataract spectacles for near objects, of two inches and a half focus, confused her sight nearly in the same manner as it had been before the crystalline lens was removed, while with those of 9 or 10 inches focus, her capability of seeing minute objects was somewhat improved. Objects at a distance she saw better without than with any glass which could be found.

Mr. Tyrrell tried the effect of altering the position of the pupil, removing it from behind the centre of the cornea, the part which has its figure most changed, to near the margin, where the least change occurs. This he did by puncturing the cornea near its margin, introducing his small blunt hook, catching the pupillary edge of the iris, drawing it out, and either leaving it prolapsed, or cutting off the portion of iris thus extracted. No evil followed in any case from this operation; and in two cases, out of seven or eight, very considerable relief was obtained.[11]

Mr. Walker, of Manchester, recommends that a trial should first be made of the above plan of displacing the pupil; and if no sufficient benefit were found to result, that the lens should be extracted, or removed by absorption. He relates a case in which extraction, preceded by displacement of the pupil, was followed by a satisfactory result in one eye, which lost its conical shape, and served the patient for reading small print at the usual distance. The other eye, having been submitted to the same process, was lost from ophthalmitis.[12]

Operative interference with conical cornea is strongly condemned by Mr. Lawrence and Mr. Walton. It is not a practice which I have ever tried.[13]

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[1] Wardrop's Morbid Anatomy of the Human Eye; Vol. i. p. 131; London, 1819.

[2] Journal of Science and the Arts; Vol. ii. p. 403; London, 1817.

[3] Carl Schmidt's Inaugural-Abhandlung über die Hyperkeratosis; p. 17; Erlangen, 1830.

[4] Zeitschrift für die Ophthalmologie; Vol. i. p. 123; Dresden, 1830.

[5] Traité des Maladies des Yeux, p. 348; Paris, 1847.

[6] Synopsis of the Diseases of the Eye, p. 286; London, 1820.

[7] Ibid. p. 124.

[8] Dublin Journal of Medical Science; Vol. xxiv. p. 387; Dublin, 1844.

[9] Article *Light*, in Encyclopædia Metropolitana, p. 398; § 359. See further on this subject, in a subsequent chapter, under the head of *Irregular Refraction.*

[10] Cursory Notes on the Morbid Eye, p. 37; London, 1840.

[11] Practical Work on the Diseases of the Eye; Vol. i. p. 277; London, 1840.

[12] Oculist's Vade-Mecum, p. 145; London, 1843.

[13] On Conical Cornea, consult Sichel, Annales d'Oculistique; 2e Vol. Suppl. p. 125; Bruxelles, 1843: Lhommeau, Ibid. p. 168: W. White Cooper, London Journal of Medecine; Vol. ii. p. 407; London, 1850.

SECTION II.—HYDROPHTHALMIA, OR DROPSY OF THE EYE.

Dropsical affections of the eyeball are sometimes connected with a cachectic state of the system, as the scrofulous, or that which attends chlorosis. They do not appear in any case either to form part of a general dropsy, or to be combined, in point of origin, with any other local dropsical affection. In general, they depend on some local cause, which has operated, not so much in directly increasing the fluid contents, as in weakening the resisting power of the tunics of the eyeball, and especially of the cornea and sclerotica.

§ 1. *Dropsy of the Cornea.*

Syn.—Chronic vesication of the cornea.

I have had occasion (pp. 519, 530, 637.) to notice that the epithelium of the cornea is sometimes separated from the anterior elastic lamina by the intervention of a watery fluid. I have seen this happen without any previous inflammation of the eye, and with the cornea perfectly clear; but, in general, there is more or less opacity, and the eye has suffered long and severely from one or other of the ophthalmiæ. Falling into folds, on the lids being closed, the loose epithelium causes the feeling as if some foreign body were in the eye.

Puncturing the epithelium, puncturing the cornea, and exposing the eye to the vapour of hydrocyanic acid, are found useful in this affection, along with the internal administration of tonics.

§ 2. *Dropsy of the Aqueous Chambers.*

Fig. Demours, Pl. LIX. *fig.* 3. Pl. LXI. *fig.* 3. Ammon, Thl. I. Taf. III. *figs.* 22—24. Dalrymple, Pl. XXIV. *fig.* 1.

Aqueous dropsy, the most common variety of hydrophthalmia, is a frequent consequence of corneitis. When it arises from this cause, or from aquo-capsulitis, or when it follows an injury of the eye, or of the surrounding parts, it rarely goes to a great extent; but when it occurs congenitally, or has a constitutional origin, it sometimes proceeds till the anterior chamber is greatly dilated.

Symptoms.—1. At first, the cornea is merely more prominent than natural. In many cases, (for instance, when it arises from corneitis,) the disease never goes beyond this. But in other instances, the cornea increases in diameter; and at the same time becomes thin. The increase in breadth may go on till the cornea is twice its natural diameter. I had a patient under my care, who could read, with a cornea still more enlarged than this. In advanced cases, it always appears a little cloudy, and sometimes becomes partially opaque, especially near its edge.

2. The iris loses its power of motion, even from the commencement of the disease, and appears of a dark colour. The pupil is generally in the middle state between contraction and dilatation; but sometimes much dilated. In some cases the lens sinks back within the eye, followed by the pupil, so that the iris presents the form of a funnel. In this case, the lens is apt to become opaque. When aqueous dropsy is the consequence of a blow on the eye or on the edge of the orbit, the iris is often tremulous, and the retina insensible.

3. The patient complains of pressure and distension in the eye; rarely of pain, unless inflammation supervenes.

4. In the commencement, the eye is short-sighted, but this changes into an amaurotic deficiency of sight, seldom reaching to complete blindness, except in traumatic cases. Muscæ volitantes are sometimes suddenly complained of, slowly followed by amaurosis. Objects sometimes appear multiplied to the hydrophthalmic eye.

5. The lids contract with difficulty over the ball. The motions of the eye are more and more impeded, in proportion as it increases in size. At the same time, it becomes harder to the feeling, and the sclerotica, necessarily forced to partake in the extension of the cornea, becomes thin, and appears blue, as in young children. The edge of the pupil is apt to contract adhesions to the opaque capsule. The iris is torn and absorbed, in consequence of the dilatation of the surrounding parts.

6. After a time, the cornea and the sclerotica become flexible; the eye is partially atrophied; the retina quite insensible.

Causes.—Except when this disease results from some evident injury, or ophthalmia, its causes are obscure. The sudden suppression of cutaneous eruptions has been mentioned as a cause.

Prognosis. — Arising from corneitis, or aquo-capsulitis, dropsy of the aqueous chambers generally remains unchanged through life; but when it is the consequence of an injury, or depends on some cachexia, it is apt to degenerate into general dropsy of the eye.

When vision is tolerably good, only short, nothing should be done to the eye itself.

Case 618.—A seaman was sent to me for advice, 31st July, 1853, from Montrose. His age was 21; when 7, a fall on the nose, which bled much, brought on corneitis of both eyes, but chiefly of the right. This ended in aqueous dropsy, which, gradually increasing, at length rendered him unable to act as a seaman. The diameter of the left cornea measured $\frac{12}{20}$ inch; that of the right rather less. There had been a speck on the right cornea. Both were very prominent, but quite clear. The light, allowed to fall obliquely through the cornea, was concentrated, and struck the inside of the sclerotica, so as to make it appear transparent. He read at the distance of 4½ inches. He saw things smaller, but not better, through concave glasses. He had tried counter-irritation and mercury, without benefit. I dissuaded him from any operation.

Treatment.—1. When the disease is the result of an injury, advantage is derived from a succession of blisters to the temple, and behind the ear; and from the use of mercury combined with purgatives.

2. If the suppression of an eruption, especially one to which the patient had long been subject, and which had been attended by a discharge, be the suspected cause, an artificial eruption, by means of friction with tartar emetic ointment, is indicated.

3. In the incipient stage, and especially when the disease is of local origin, friction round the eye with mercurial ointment has been found useful.

4. If the disease is advanced, and vision much affected, but the sclerotica not yet discoloured by being involved in the distension of the eye, paracentesis oculi ought to be employed.[1] An incision may be made through the cornea, two lines long, and at the distance of half a line from the sclerotica. Beer recommends not merely that the aqueous humour should be evacuated in this way, but that the wound should be re-opened every day, for a number of successive days, or even weeks. More than once he had observed general remedies to have a good effect after this operation, although they had had none before. If it is not successful in curing the disease, it proves at least a palliative; and, if too large an opening is not made, may be frequently repeated with advantage.

The above description applies to dropsy affecting either both chambers of the aqueous humour, or the anterior chamber alone. In cases of closed pupil, a bulging of the sclerotica over the ciliary processes sometimes occurs, which is attributed to a dropsy of the posterior chamber; and a similar state is apt to happen when, in consequence of perforating ulcer of the cornea, the anterior chamber is obliterated by adhesion of the iris to the corneal cicatrice. In such cases the tension may be relieved by puncturing the eye.[2]

§ 3. *Sub-Sclerotic Dropsy.*

I have already had occasion (page 518.) to mention a watery effusion between the sclerotica and the choroid, or between the choroid and the retina, as an occasional result of inflammation.

Although the internal surface of the sclerotica is connected to the external surface of the choroid by numerous vessels and nerves, a serous fluid sometimes accumulates between these tunics, so as to constitute what we may term sub-sclerotic hydrophthalmia.

The symptoms of this disease will in some respects resemble those arising from a dropsical effusion between the choroid and the retina; and will, like them, derive relief from the operation of puncturing the eye, and allowing the collected fluid to escape.

§ 4. *Sub-Choroid Dropsy.*

Fig. Wardrop, Pl. XV. *fig.* 2. Panizza, Appendice, Tav. I. *figs.* 3—6.

I may here refer to what I have said on scrofulous sclerotitis (page 516.), and on choroiditis (page 569.), which, in general, will be found to have preceded or to accompany sub-choroid hydrophthalmia. This disease appears also to originate from injuries, and sometimes from arthritic ophthalmia (page 561.)

Cases of sub-choroid dropsy, proceeding so far as to cause absorption of the vitreous humour and compression of the retina, have been described by many observers.[3] The progress of the dropsical effusion and the symptoms by which it is accompanied are by no means alike in all cases. When the accumulation takes place slowly, the loss of vision is gradual, and the attending pain and redness are not severe. But if the water is collected quickly, it is accompanied with great pain both in the eye and head. In an early stage, the patient retains a degree of lateral vision; but he soon becomes completely amaurotic. The pupil appears of a dark brownish hue when the eye is viewed at a little distance. On nearer inspection, a whitish or yellowish opacity is seen behind the pupil, generally towards the nasal or temporal side of the eye, and partially covered with red vessels. On examining the eye catoptrically, the deep erect image is observed to be large and distinct, but the inverted image is not visible; showing that the lens is transparent, but that close behind it there is an opacity, which, while it acts as a foil for the deep erect image, prevents the inverted from being formed. As the disease advances, the opaque substance, which is, in fact, the coarcted retina, presents a funnel shape, or the appearance of a number of folds radiating from a centre, and affected with a floating or trembling motion. Mr. Wardrop[4] mentions, that in one instance this appearance was mistaken for cataract, and an attempt made to couch it; a fruitless operation, which gave great pain. Such a case has also been taken for encephaloid tumour, and the eye extirpated. By and by, the pupil is dilated, and sometimes displaced; the lens becomes opaque, and the cornea shrinks. There may be no enlargement of the eye under such circumstances. But in other cases, the choroid and sclerotica become attenuated, while the eyeball undergoes either a general or partial extension.

Treatment.—In suspected cases of sub-choroid hydrophthalmia, there can be no doubt of the propriety of following the practice of Mr. Ware, and puncturing the eye at the usual place of passing the cataract needle through the sclerotica and choroid. Mr. Ware recommended a grooved needle for this purpose, so that the fluid might more certainly escape; but a better plan is, to puncture with a broad cataract needle, or the point of the extraction knife, and then hold the edges of the wound apart by means of a small probe. Care should be taken in making the puncture to direct the point of the instrument, so that it may not wound the posterior part of the crystalline capsule. The operation may be repeated from time to time, should the symptoms seem to demand it.

The first case related by Mr. Ware affords a good example both of the disease, and of the relief afforded by paracentesis:—

Case 619. — A lady of about 45 years of age, perceived a dimness in her left eye, the cause of which she was unable to assign. She supposed it to have been the consequence either of taking cold, or of the cessation of a discharge from one of her legs, to which she had been subject. The dimness was discovered accidentally, on her attempting to see an object with the left eye whilst the right was shut, and in a short time the sight afforded by that eye rendered her no assistance; objects placed straight before it being invisible, and their appearance, when removed to the outer side of the axis of vision, obscure and indistinct. The eye had not altered its appearance in any respect, the pupil being neither cloudy nor dilated. In December, 1804, about two years after the dimness was first perceived, she began to feel pain in the eye, and it became slightly inflamed. Although the inflammation never appeared considerable, the pain increased to a most violent height, affecting, in a few days, both the eye and the head, and proving particularly severe during the night. The pupil now, for the first time, became dilated, and had a misty appearance; but the degree of opacity was very insufficient to account for the total loss of sight.

Leeches, blisters, fomentations with poppy heads, and a free use of opium internally were repeatedly tried, but did not afford relief. The internal employment of muriate of mercury was equally ineffectual. The progress of the disorder, and the state of the patient at this period, closely resembling those of another patient, in whose eye, after death, Mr. Ware had found a sub-choroid collection of thin fluid, with coarctation of the retina, led him to think that the violent pain which this lady suffered might depend on a similar state. It also occurred to him that if the effused fluid could be discharged, it might afford relief. The operation seemed neither impracticable nor difficult, and the patient readily acceded to submit to it, as indeed she would have done to any operation, so extreme was the pain she endured.

Mr. Ware introduced a spear-pointed couching needle through the sclerotica, a little farther back than where it is usually introduced for depressing a cataract. As soon as the instrument entered the eye, a yellow fluid escaped, sufficient in quantity to wet a common handkerchief quite through. The needle was kept in the eye about a minute, in order to afford the fluid a more ready exit; and as soon as it was withdrawn, the discharge ceased. The tension of the eye was considerably diminished by the operation. A compress dipped in a saturnine lotion was bound upon it, and the patient put to bed. She continued in pain about ten minutes, but then fell into a sound sleep which lasted upwards of two hours; and on awaking, her eye was quite easy. The compress was again moistened with the saturnine lotion, and she took some nourishment. She passed the next night comfortably, without laudanum, although previously it had been given her in large doses. The same application was continued to the eye, which afterwards remained perfectly easy, with scarcely any appearance of inflammation. The pupil continued dilated, but did not become opaque. About three weeks after the operation, the patient caught a cold, and complained that the eye felt more tender than usual. Mr. Ware was alarmed lest a fluid might again be effused in the old place, and the pain return; but this was happily prevented by the application of a blister on the side of the head.[5]

Although the following case is related by no less an authority than Professor Panizza, as one of medullary fungus, I think the reader will grant, that the appearances on dissection vindicate me in placing it under the head of sub-choroid dropsy. The colour, consistence, and relations of the diseased mass are widely different from what has been observed in fungus hæmatodes.

Case 620. — The patient was a lively, healthy child, aged 20 months, affected with what was considered to be malignant or medullary fungus, originating in severe internal ophthalmia, consequent to painful dentition. The appearances attributed to fungus had been observed for a month. The diseased eye was of the same size as the other, perfectly moveable, and not inflamed; the pupil was widely dilated, and immoveable. Behind the pupil, and apparently in the bottom of the eye, was a spot of a pale yellow colour, divided by furrows into three tubercular-like eminences. In the furrows, a red vessel was seen ramifying. The spot was better seen, and appeared nearer to the pupil, by looking down into the eye than upwards. When it was looked at in the direction of the eye's axis, it seemed more distant, or at the bottom of the eye. Vision was entirely lost.

Donagana extirpated the eye, on the 10th December, 1822, six weeks after the commencement of the complaint. In 1826, when Panizza published the case, there was no re-appearance of the disease.

The extirpated eye was natural in size and form, but its consistence somewhat firmer than common. The optic nerve seemed healthy. The canary-coloured spot was seen through the cornea. On removing the cornea, the aqueous humour was discharged. The iris was healthy. By tearing it away from the orbiculus ciliaris, the crystalline was exposed, perfectly transparent, and enclosed within its capsule, Looking through the lens, the spot to all appearance lay at the bottom of the eye; but on opening the capsule, and removing the lens, it was seen to be close to the posterior capsule. Its apparent distance, then, when viewed through the crystalline, was an optical illusion. By removing a line's breadth of the choroid, which, as well as the ciliary processes, was natural, a yellowish soft fungous substance was exposed, apparently containing a fluid. At its upper part, there was a triangular area, where the hyaloid was healthy, and the vitreous humour limpid. On puncturing the hyaloid, and giving exit to a small quantity of vitreous fluid, one of the three yellowish prominences suddenly rose, as if it had been compressed, and took the place which had been occupied by the vitreous humour just discharged. Panizza concluded from this, that the vitreous body had become atrophied by the growth of the tumour.

The tumour was soft, elastic, and where it was marked by the furrows already mentioned, its prominences could be separated a little with the probe. Desirous of discovering more completely the relations of the tumour, which seemed to be the retina in a fungous state, Panizza removed a portion of the sclerotica towards the back of the eye, and was proceeding to cut through the choroid, when there suddenly issued a fluid of a canary colour, and the three tubercular eminences immediately sank down a little. The fluid which escaped coagulated by coming in contact with alcohol. To prevent the remainder from escaping, the eye was put into alcohol. The fluid which had escaped was glutinous, and of a salt taste; it lost much of its yellowish colour on being suddenly coagulated by the alcohol into a homogeneous consistent mass. The eye being left in a cup filled with alcohol till next day, was found adhering to the bottom of the cup by means of some of the fluid which had coagulated.

Continuing the dissection, Panizza removed the posterior part of the sclerotica and choroid, which were healthy, and exposed the interior of the eye, filled with the straw-coloured substance. This substance was granular, and when taken between the fingers, it became reduced to a fine powder. As there was no appearance of the retina beneath the choroid, it seemed probable that the tumour was the product of a fungous degeneration of the retina, more especially as the tumour was continuous with the optic nerve at its entrance into the eye. The nerve, also, had the same colour with the tumour. The tumour was somewhat uneven on the surface, but everywhere presented a consistent granular substance, which on analysis was found entirely albuminous.

Panizza next observed that the optic nerve, gradually expanding, seemed to pass into the tumour. Cautiously removing the soft granular substance, he found, to his surprise, the retina reduced to a conical form, shrunk, and folded together in the middle of the tumour. It extended from the entrance of the optic nerve to the eminences already noticed, which were in fact protuberances of the retina, produced by the push of the yellowish fluid enclosed behind it. Hence it appeared that the tumour did not consist in a fungus of the retina, but was the effect of the yellowish fluid gradually accumulating between the choroid and the retina, and causing the latter to close towards the centre of the eye. The vitreous humour, in proportion as the morbid deposition increased, must have necessarily disappeared, and accordingly only a small portion of vitreous humour was present. Knowing from anatomy with what firmness the anterior termination of the retina adheres to the great circumference of the corpus ciliare, it was easy to understand how the fluid, collected between the choroid and the retina, could not make its way into the posterior chamber, and hence into the anterior. It was evident, also, why the retina, pressed on all sides by the fluid accumulating between it and the choroid, was forced to separate from the choroid, and, folding itself together towards the centre of the eye, should compress the hyaloid, and diminish gradually the secretion of vitreous humour. The same fluid also forced the retina to protrude anteriorly in the form of three roundish eminences, with furrows between them. It was equally clear, how the morbid secretion, had it increased much more, would have forced the retina into contact with the lens, would have pressed the lens against the iris, and this against the cornea, irritating all these parts, and rendering them dim, and atrophic.[6]

§ 5. *Dropsy of the Vitreous Body.*

Fig. Ammon, Thl. I. Taf. IV. *fig.* 20. Taf. VII. *figs.* 8—11.

Vitreous dropsy is characterized by the following symptoms:—

1. An increase of size, chiefly behind the cornea, which is pushed forwards without undergoing any other change, while the sclerotica bulges out between the recti, so that the eye becomes somewhat of a square shape.

2. The aqueous humour diminished in quantity, and the iris pressed forwards, or even into contact with the cornea; the iris is not changed in colour, nor the pupil extremely dilated.

3. The eye, touched with the finger, feels excessively hard.

4. The sclerotica, from distension, assumes a deep blue colour.

5. Weakness of sight, soon followed by complete amaurosis, so that not even the least sensibility to light remains.

6. The movements of the eye are much sooner impeded than in aqueous dropsy. At last it becomes altogether motionless.

7. There is pain in the eye from the very commencement. It daily increases in violence, and spreads to the half of the head, to the teeth, and to the neck. At last the patient becomes almost mad with the pain, and calls upon the surgeon to evacuate the contents of the eye. Beer saw a man who did this for himself with his penknife.

8. Even when the pain is comparatively moderate, the patient's sleep and appetite entirely fail.

Causes.—Except in cases of injury, these are equally obscure as those of dropsy of the aqueous chamber. A scrofulous or syphilitic cachexia is blamed, or a union of both is sometimes suspected.

Treatment.—General remedies may be directed against the particular cause which is supposed to give rise to the disease; but most relief is derived from diminishing the quantity of the vitreous humour. In one case, resulting from an injury, and in which the lens was opaque and displaced, I succeeded in curing the vitreous dropsy by repeatedly tapping through the cornea. But, in general, this operation is to be performed through the sclerotica and choroid, as in cases of sub-choroid dropsy. The vitreous humour, when the puncture is made, is apt, as in choroid staphyloma, to infiltrate the sub-conjunctival cellular membrane to an enormous extent, sometimes to such a degree that the cornea is hid by the swelling. In one case in which this event happened in my hands, the pain which ensued was very severe; but the dropsy was cured by the continued pressure, exercised for ten or twelve days, on the empty eyeball, by the fluid lying under the conjunctiva. Repeated punctures of the sclerotica produce inflammation of the interior of the eye, ending in a destruction of the secreting power. Sometimes the inflammation is more severe, bringing on adhesions of the iris, and opacity of the cornea. The eye becomes atrophic, soft, and free from pain.

Repeated paracentesis failing, the mode recommended by Beer will require to be adopted; namely, a section of the cornea, as in extraction, by which to evacuate the lens with part or the whole of the vitreous humour, after which the coats of the eye gradually shrink.

§ 6. *General Hydrophthalmia.*

Fig. Demours, Pl. LXII. *fig.* 2. Ammon, Thl. III. Taf. III. *figs.* 6, 7. Taf. V. *figs.* 11, 13. Taf. XV. *fig.* 2. Dalrymple, Pl. XXXII. *fig.* 3.

Both the aqueous and the vitreous humours may be increased in quantity at the same time, so that the whole eye is enlarged, in which state the name *buphthalmos* has been bestowed on it, from its resembling the eye of an ox.

This disease presents a union of the symptoms of the second and fifth varieties of hydropthalmia, as far as they can co-exist. When congenital it is styled *megalophthalmos,* and is often accompanied with opacity of the cornea. All the tissues of the eye, in this case, appear equally enlarged: not only is the cornea broader and more prominent, and the aqueous chambers more capacious, but the iris is proportionally more developed than is natural. In some congenital cases the eye is so large that the lids cannot be closed without difficulty. When general hydrophthalmia occurs in after-life, and is rapid in its progress, it is attended by excessive pain; the motion of the eye is lost; the patient is deprived of sleep, loses all appetite for food, and becomes delirious; if the case is neglected, caries of the orbit may even take place, and the patient die, worn out by fever.

Beer had met with this disease only in extremely cachectic, and especially scrofulous and scorbutic subjects.

Congenital cases sometimes do well without treatment[7]; the cornea gradually clearing, and the eye, if not shrinking to its natural dimensions, at least remaining stationary in point of size.[8] In other cases, the disease continues moderate till puberty, when the eye suddenly enlarges, the pupil, widely dilated, contracts adhesions to the capsule, which becomes opaque; the iris is lacerated by the stretching to which it is subjected, the retina loses its sensibility, and, after a time, the eye becomes soft and atrophic.

Mercury, squills, digitalis, and counter-irritation have been recommended; but I should place greater confidence in tonics. Iodide of potassium, and cod-liver oil might be worthy of a trial. Other remedies failing, evacuation of the contents of the eye may be called for, as in vitreous hydrophthalmia.

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[1] Nuck, De Ductibus Oculorum aquosis; p. 120; Lugduni Batavorum, 1723.

[2] Bowman's Lectures on the Parts concerned in the Operations on the Eye; pp. 77, 140; London, 1849.

[3] Zinn, Descriptio Anatomica Oculi Humani, p. 25; Gottingæ, 1780: Scarpa, Trattato delle Malattie degli Occhi; Vol. ii. p. 172; Pavia, 1816: Ware's Observations on the Treatment of the Epiphora, &c. p. 284; London, 1818: Wardrop's Morbid Anatomy of the Human Eye; Vol ii. pp. 65, 273; London, 1818.

[4] Op. cit. Vol. ii. pp. 67, 274.

[5] Remarks on the Ophthalmy, &c. p. 233; London, 1814. See also Ware's Observations on the Cataract, and Gutta Serena; p. 443; London, 1812.

[6] Sul Fungo Midollare dell' Occhio Appendice di Bartolomeo Panizza, p. 9; Tav. i. fig. 3, 4, 5, 6; Pavia, 1826.

[7] Ware, Op. cit. p. 285.

[8] Ammon gives figures representing the progressive clearing of the cornea in such cases, in his Darstellungen; Theil III. Taf. VII.

SECTION III.—SANGUINEOUS EFFUSION INTO THE EYE.

Syn.—Hæmophthalmos. Hypæmia. Apoplexia oculi. Das Blutauge, *Ger.*

Fig. Ammon, Thl. I. Taf. II. *figs.* 16, 17. Taf. IX. *fig.* 20. Taf. XV. *fig.* 17. Taf. III. *fig.* 5. Taf. XV. *fig.* 21. Taf. XVII. *fig.* 4. Thl. II. Taf. I. *figs.* 1, 11, 16, 17, 20—24.

To treat fully and systematically of effusion of blood into the eye, many distinctions would require to be observed, according as it has a traumatic origin or occurs spontaneously; happens in a healthy eye, or in one more or less disorganized by previous disease; according as the constitution of the patient is sound, or affected with scorbutus, purpura, or any other malady; and according as the cornea, the aqueous chambers, the vitreous body, or the retina is the seat of the hæmorrhage.

Of effusion of blood from injuries of the iris, and blows on the eye, I have already (pp. 295, 407.) spoken. I shall hereafter have occasion to explain, that a discharge of blood takes place in all the operations for the formation of an artificial pupil; and that the same accident is apt to attend, or to follow, the operations for cataract. Under the head of amaurosis, I shall have occasion to speak of apoplexy of the retina. Small quantities of blood are sometimes seen to accompany hypopium, especially that which arises from the bursting of an abscess of the iris. Blood is also occasionally effused into the substance of the cornea, and on the surface of the iris, in consequence of inflammation, especially in syphilitic and arthritic cases. Beer describes[1] extravasation of blood into the anterior chamber as occurring in the ophthalmia which sometimes occurs in scurvy; and Dr. Graves has recorded[2] a case of fatal purpura hæmorrhagica, in the course of which an effusion of blood took place into both eyes.

It may be laid down as a general rule, that blood effused into any part of the eye, is absorbed the more speedily, as the eye is healthy. If it is diseased in other respects, the absorption is slow, and incomplete; and the pupil is apt to close, and the eye to become atrophic. Poured into the anterior chamber of a healthy eye, blood is dissolved in the aqueous humour, and absorbed in the course of a few days, unless it has coagulated so as to form a clot. When this happens, it may take weeks or months to disappear. Even fluid blood is long of being absorbed, if it is effused into an eye, the aqueous chambers of which, in consequence of previous disease, are occupied, not by aqueous humour, but by yellow serum. Mr. Bowman supposes[3] that the blood corpuscles swell in healthy aqueous humour, and give up their colouring matter to it, and that this is the occasion of their rapid disappearance; but, without denying this, Dr. Meyr has pointed out[4] that in wounds of the eye by which the aqueous humour is totally evacuated, and its place instantly occupied by blood, the blood will sometimes be absorbed in twenty-four hours, provided proper means are taken to prevent inflammation. In respect to effusion of blood, also, in other parts of the eye, it is not to be doubted that the means most likely to promote absorption are those which will obviate inflammation.

The attention of the reader should be particularly directed to an internal hæmorrhagy of the eye, which appears neither to arise from injury, nor to depend altogether on inflammation, and which sometimes has been called *apoplexy of the eye.* This hæmorrhagy may occur either in an eye apparently sound, or in one which has suffered from previous disease. It arises from active hyperæmia in some cases; from passive weakness of the vessels in others.

An example of sanguineous effusion, occurring in an eye previously healthy, is related by Mr. John Bell.

Case 621. — The patient, a young gentleman not 20 years of age, was six feet high, and when he was first affected with the disease, was growing so rapidly that he believed he had gained five inches in the year. Early in September, on the day on which he was first attacked, he ate very heartily a hurried dinner, when, a companion having called while he was yet at table, and proposed a party in a house at some distance, he went with him, and being mere lads, and in a playful humour, his friend ran, and he pursued at full speed, for the space of three or four hundred yards. He instantly was sensible of his sight becoming dim in the left eye. He disregarded at first a feeling which he imagined to be temporary, but, having arrived at the house, and sat down, he was alarmed to find his vision still more obscured, and, turning to those in company, he asked whether they perceived anything wrong in his eye. They saw blood upon it. The bloody effusion took place, the blood became visible, and the vision of the left eye was entirely obscured in the space of fifteen minutes. He was then assailed with dreadful pain. For ten days he continued entirely blind of that eye.

Vision was gradually restored, by the blood, which had filled the whole of the anterior chamber, subsiding below the level of the pupil. Blood was still visible in the lower part of the eye, and continued so for three weeks; it gradually vanished, and the eye recovered its wonted appearance, except that, in the very lowest part, below the level of the pupil, there remained a little white clot of the effused blood. Such was the first attack of the disorder, from which he continued free for the space of six months.

One evening in May, 1804, while sitting at supper, not conscious of any previous excitement, but probably affected by the supper, wine, light, and heat, and animated conversation, he suddenly perceived the obscurity coming over his vision, the blood again appeared in the eye, which was next morning affected with violent pain: yet this was, in all respects, a less severe paroxysm than the first.

Little more than a month had elapsed, when having, in the warm month of June, gone into the river to bathe, as he was in the act of swimming and just coming out of the water, he was struck with this obscurity of vision. The blood instantly came over his eye, which, on the ensuing day, was affected with most excruciating pain, extending to the temple; but in three weeks or a month, his sight was completely restored, and the eye recovered its natural clearness. In the end of September, or beginning of October, he was again attacked, though he was conscious of no excess, but had been quiet, regular, and discreet in his way of living; he was seized while writing, and recollected no sensible cause to which the paroxysm could be ascribed, unless it were the hanging of the head and straining of the eye. The blood was absorbed again within the usual period, and sight restored.

On the 1st of November, in walking across a bridge at night, betwixt 10 and 11 o'clock, he sustained the fourth attack, but without such total loss of vision, or so much effusion of blood as heretofore. The blood was not so long of being absorbed, nor was he so long obliged to cover the eye from the light: in eight or ten days he was able to uncover the eye, the suffusion of blood was gone, but the coagulum, occupying the anterior chamber, was manifestly accumulating. On the 3d of February, 1805, he had a like paroxysm, arising from very obvious causes. Being the day for electing a Member of Parliament for Edinburgh, his regiment was marched out of town to the distance of 18 miles: and both in marching out to the temporary quarters allotted for his regiment, and in returning, he walked along with the men, was greatly heated by the exercise, and very naturally referred this attack to a cause so expressly resembling that which first gave rise to his malady.

From this time the paroxysms became periodical, and seemingly spontaneous; they returned once a month, the eye was kept in a state of constant irritability and frequent pain, so that the patient was forced to have it constantly covered from the light; yet no circumspection in this respect, nor in his habits of living, seemed to avail him. Of the few paroxysms arising from any obvious excitement, one was on the morning after a review, in the month of August, when, after being in the field, he sat down to a dinner of ceremony, and drank late. Although not conscious of having been intemperate, he went to bed, perhaps a little heated with wine; he rose early in the morning to go upon guard, and, while stooping to wash his face, he was sensible of the effusion of blood, and return of the blindness. The second memorable occasion was still more particular in the circumstances, and the excitement more marked than any of the others. He had gone to a supper party of young people, where a most unusual degree of hilarity prevailed; he joined the general mirth, and laughed so immoderately, that he saw the candles dim, and, in a moment, found his eye suffused with blood.

The disease now took a decided form; returning sometimes once a fortnight, sometimes once a month, two months seldom elapsing without a new effusion of blood. The sensibility of the eye was such, that he was obliged to keep it always shaded; and each new effusion was now followed by a paroxysm of pulsatory pain in the temple of that side, in some degree relieved by steady and continued pressure. The effusion now returned without any express or sensible cause, the predisposition being so strong, that he came to a conviction, that laughing, crying, singing, running, swimming, stooping, excess in wine, or any of those occasions which at former times produced the effusion, would cause it instantly to return.

Mr. Bell remarks, that it must seem very surprising, that an organ so delicate as the eye, should be able thus to sustain repeated effusions of blood, without having its structure entirely ruined. The resistance of its coats, filled and tense with its own humours, plainly had its effect in limiting the effusion. When he drew up the case, the coagulum which, in consequence of its bulk, was very thinly covered with the blood, was almost white, occupied all the lower part of the anterior chamber, and covered part of the pupil. Vision was not extinct, but he feared it was irremediably injured. Strict regimen, profuse evacuations, a seton in the neck, and opiates to appease the sensibility of the eye; an abstemious, quiet, and regulated course of life, would, he trusted, prevent future effusions; and when the paroxysms of local arterial action should be abated, he hoped that much of the coagulum would be absorbed.[5]

The subject of the following case, recorded[6] by Dr. C. Lockhart Robertson, I had occasion to see in consultation with Dr. J. A. Robertson, on the 27th November, 1843. The case affords a well-marked instance of effusion of blood into the vitreous humour, recurring at intervals, without direct injury, and presenting appearances so much resembling medullary carcinoma, that the nature of the disease could be determined only by the history of the symptoms.

Case 622.—Miss ——, aged 29, when 15 years of age was affected with red spectra before the right eye, which in about a week yielded to laxatives. When 20 years of age, she remarked that the left eye retained the impression of an object for some seconds after the object had been removed, and vision gradually became more and more impaired in that eye, till August, 1839, when she could not distinguish with it light from darkness. Under the use of leeches and blisters, with mercury so as to affect the system, in December the sight began to improve.

In June, 1840, she had an attack of blindness in both eyes, accompanied by severe pain in the eyes and forehead, which yielded to the same remedies. In January, 1842, she had another attack in both eyes, of a slighter character. In December of the same year, the disease suddenly recurred in both eyes, and again yielded to leeches and mercurials. While still under treatment, she had in January, 1843, a sixth attack in both eyes. The same remedies were continued. Subsequently electro-magnetism was tried, with temporary improvement. In August, 1843, the disease suddenly recurred, for the seventh time, in the right eye, owing, it was supposed, to a sudden fright, and again yielded to leeches and mercury. Sight continued improving till May, 1845, when she had another slight attack in the same eye. Under leeches and mercury, vision again improved.

The right eye, after each attack, presented the following appearances: — The conjunctiva and sclerotica were healthy, the pupil dilated, but perfectly regular, the colour and texture of the iris natural. On dilating the pupil by belladonna, and allowing the focus of a double convex lens to fall on the eye, it was observed that an effusion of blood had taken place into the vitreous humour at its nasal side, and about half way between the iris and the optic nerve. Gradually the red colour disappeared, leaving a mass of a brownish yellow colour, with a semi-metallic lustre. Under the action of mercurials, the bulk of this deposit was lessened, and vision improved. When Dr. C. L. Robertson drew up the case, it was about the size of a hazel-nut.

No effusion could be traced in the left eye.

The pale-coloured mass in the right eye presented appearances nearly resembling those observed in the first stage of medullary carcinoma, from which, Dr. C. L. Robertson points out, it was distinguished by the following diagnostic marks: —

1. By the red colour presented by the tumour, after each effusion, which contrasted with the unvarying dark amber or greenish hue of incipient medullary carcinoma; while the single red vessels, which, in the latter, may be traced over the tumour, were not present.

2. The pupil, instead of being, as it is in medullary carcinoma, irregular, and having the transverse diameter the larger, was equally and regularly dilated; while the colour and texture of the iris remained unaltered, instead of being thinned, or presenting the injected or reddish-yellow hue, which it does in incipient medullary carcinoma.

3. The tumour decreased in size, and sight gradually returned, under the use of mercurials; while in the malignant affection, the size of the tumour never decreases, and vision becomes more and more impaired, in spite of all remedial means.

When I saw the patient with Dr. J. A. Robertson, a floating yellow film was visible behind the lens, which was perfectly transparent. I concluded from the appearances, that the cells of the vitreous humour must have been broken up. The patient mentioned, that one of the attacks was brought on from ascending Goatfell, a high mountain in Arran.

In the following case, an injury of the eye, which had produced opacity of the lens, appeared to have left the organ in a state apt to suffer from internal hæmorrhage, upon over-exertion of the body.

Case 623. — A carter, whom I had seen, some years before, with lenticular cataract in the right eye, the effect of a blow, called on me in March, 1836, with the anterior chamber of the eye half filled with blood. He attributed this to working hard during three successive nights. In three days more, the anterior chamber was completely filled with blood so that the cornea appeared of a dark chocolate colour. There was slight sclerotitis, with heat and pain of the eye, and headache. I advised rest, with cold applications to the eye, and abstinence from spirituous liquors, to which the patient was rather addicted.

The following case affords an example of effusion of blood occurring in an eye, which had previously suffered disorganizing inflammation: —

Case 624. — Caroline Pilsen, aged nine years, of a scrofulous habit of body, came under the care of Dr. Ammon in July, 1829. Vision had been dim for some months. On examination, it was discovered that the left eye was quite blind, and affected with strabismus; and the right eye very myopic. The cornea of the right eye had lost much of its convexity, and the iris, which was of a yellowish green colour, projected unnaturally into the anterior chamber. The pupil was irregular, angular, and much contracted. In the left eye, the outer portion of the iris was much broader than the inner, the pupil was oblong, and appeared angular, especially towards the inner side. The iris was of a brownish green colour, and a great many vessels were seen running from its ciliary to its pupillary edge. The pupil of this eye daily became larger, and the sensitiveness of the eye increased, so that examination of it was difficult.

One day when the eye was less sensitive, Dr. Ammon perceived, as he was examining it, that the pupil was nearly natural, but that on the inner circle of the iris there was a deposition of a black matter, so deep in its tint that he at first thought the iris had been removed by absorption at that part. He also observed that the lens was dislocated inwards, so that one half of it was concealed behind the inner part of the iris and sclerotica, whilst the other half lay with its outer edge right in the centre of the pupil. Through that part of the vitreous body which was exposed by this displacement of the lens, a whitish-gray appearance was seen at the bottom of the eye.

Some days after this, Dr. A. found the girl lying on her face asleep. When she awoke, he was surprised, on examining her eye, to see a quantity of blood in the anterior chamber, and the whole cornea quite red. Examining the eye next day, the extravasation of blood was found to have disappeared. Dr. Ammon, having made the patient bend her head forwards, and keep it so for some minutes, found the anterior chamber almost quite full of blood, which moved from one side to the other with the motions of the head. Some spots of the blood adhering to the iris, on being examined with a lens a few hours after, were found to have become dark in colour, next day to have changed into a brown colour, and in a few days to have become almost quite black. These spots, when once formed, did not disappear, unless they were on the ciliary edge of the iris, and very small. This state of the eye continued for nearly two months, and the slight degree of vision which previously existed became wholly extinguished. The cornea retained its transparency, but grew flatter and flatter, and the black colour of the edge of the pupil and of the rest of the iris increased.

In February, 1830, the girl had a slight inflammatory fever, and then it was remarked that the ecchymosis in the eye increased much, and that it more quickly blackened the anterior surface of the iris. The extravasation of blood ceased at length under the use of tincture of iodine.[7]

Cases are recorded which show that hæmophthalmos may be vicarious with the menstrual discharge[8]; recurring either at monthly intervals, till the catamenia are established[9], or supervening in consequence of their cessation.[10]

The prognosis in spontaneous hæmophthalmos must always be dubious, the complaint being so liable to return, and so likely at last to compromise the integrity of the most important structures of the eye.

Attention to the general health, an appropriate diet, moderate and regular exercise, and the avoidance of all over-exertion, especially of such as requires stooping, ought to be urged on the patient, as the most likely means of prevention.

When the disease is the result of active hyperæmia, depletion, general or local, according to the circumstances of the case, purgatives, and cold applications to the eyes and head, will, in the first instance, be proper. The absorption of the effused blood will afterwards be aided by the cautious use of mercury. In cachectic cases, and those in which weakness of the vessels is in fault, antiscorbutics, astringents, and tonics, will be necessary. In all instances the eyes should be shaded, and the pupils be kept under the influence of belladonna. Some particular cases may require paracentesis corneæ.

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[1] Lehre von den Augenkrankheiten; Vol. i. p. 633; Wien, 1813.

[2] Dublin Journal of Medical Science; Vol. xi. p. 395; Dublin, 1837.

[3] Lectures on the Parts concerned in Operations on the Eye, p. 78; London, 1849.

[4] Beiträge zur Augenheilkunde, p. 17; Wien, 1850.

[5] Bell's Principles of Surgery; Vol. iii.

p. 270; London, 1808. See case by Walther, Merkwürdige Heilung eines Eiterauges, p. 61; Landshut, 1819.

[6] Northern Journal of Medicine; August, 1845.

[7] Zeitschrift für die Ophthalmologie; Vol. i. p. 103; Dresden, 1830.

[8] Walther, Op. cit. p. 50.

[9] Tyrrell's Practical Work on the Diseases of the Eye; Vol. i. p. 40; London, 1840.

[10] La Lancette, quoted in London Medical Gazette, October, 1829; p. 123.

SECTION IV.—NON-MALIGNANT TUMOURS OF THE EYEBALL.

In the last five Sections of Chapter IV., I have described certain excrescences and tumours of the conjunctiva, which, in general, will easily be distinguished from diseases originating in or within the proper tunics of the eye.

It is of great importance to be acquainted with the fact, that different textures of the eye are apt to be affected with depositions, tumours, and fungous degenerations, which are not malignant, and which sometimes subside of themselves. There is reason to think, that such growths have often been mistaken for malignant diseases, and especially for fungus hæmatodes.

Varieties.—1. In some cases, depositions of blood (See Case 622), lymph, or pus in different textures of the eye, assume the appearance of fungous growths. Some of these depositions are capable of becoming organized, and this may add to the resemblance they will bear to certain tumours. 2. In other cases, it seems probable that scrofulous tubercles, similar to those frequently met with imbedded in the cerebrum of children dying hydrocephalic, form upon or within the eye. Fibrous, or fibro-plastic tumours (see page 252.), are sometimes found attached to the sclerotica, or imbedded in its substance, or in that of the iris, or the choroid. Such tumours, lying deep in the eyeball, will with difficulty be distinguishable from fungus hæmatodes. 4. Cysts or encysted tumours are met with in the interior of the eye.

§ 1. *Non-malignant Tumours of the Sclerotica and Cornea.*

I have seen several cases of what seemed scrofulous tubercles, but which perhaps were rather fibro-plastic tumours, originating from the sclerotica, sometimes single, sometimes in clusters, soft in some cases, and firm in others, but with little or no vascularity. These tumours bear an external resemblance to molluscum contagiosum, as we often see it in the eyelids of children, but on microscopical examination they are found quite different, presenting an obscurely fibrous structure. The subjects of such affections were, in most instances, cachectic children, often presenting scrofulous swellings in different parts of the body, and in whom the affected eyes had suffered from internal ophthalmia before the appearance of the tumours. The conjunctiva giving way, such tumours are apt to undergo a process of slow ulceration, by which they are destroyed, and which often implicates the cornea, after which the eye becomes atrophic. Such tumours present themselves more frequently on the temporal side of the eyeball than elsewhere. They are at first of a whitish colour, but after they ulcerate on the surface, they become red, and sometimes send forth a fungus, connected by a pedicle to the sclerotica, and capable of increasing so much as to cover almost the whole eye. In one case, which I saw with Dr. A. Anderson, the tumour was destroyed by ulceration, leaving so thin a covering to the choroid, that the portion of the eye where the tumour had been situated, was left of a dark, almost black, colour, while the interior of the eye remained sound. Several of the patients whom I have seen have afterwards died of chronic disease of the lungs.

I have found, in the early stage, that the application of leeches, and counter-irritation behind the ear, were useful. To improve the general health, by country air, mild nutritious diet, and the use of tonics, is of great importance.

Case 625. — A girl, about 7, had several scrofulous tubercles on the cheek and chin, and a tumour on the temporal side of one of her eyes, which seemed of the same character. The conjunctiva covering it gave way, and the tumour enlarged to the size of a hazel-nut. It was of a white colour and soft consistence, and evidently involved the sclerotica. The patient died of tubercular phthisis.

Case 626. — A young lady, about 12, had a scrofulous tubercle attached to the upper part of the sclerotica; the eye had suffered much from scrofulous internal inflammation; the tubercle was of a yellow colour, it slowly enlarged to the size of an almond, and seemed about to fall into a state of suppuration, but did not actually suppurate. The general health was much impaired, and I learnt that the patient died soon after the occurrence of the symptoms above mentioned.

Case 627. — A girl was brought to me for advice, who presented a cluster of scrofulous tubercles on the lower half of the sclerotica, close to the cornea. The vision of the eye was dim, the cornea hazy, and the pupil was dragged towards the side of the eye on which the tumours were situated. This patient was benefited by the application of leeches.

Case 628. — A boy was brought to me by Dr. Ferrie, from the House of Refuge, with a tumour occupying the temporal side of the eye. It had ulcerated, and presented a red granular surface. The eye was completely inverted. The tumour felt as if it fluctuated, being probably lined by the choroid, and filled with vitreous fluid, similarly to a choroid staphyloma. It was excised, and the part removed was microscopically examined by Dr. A. Anderson. (See p. 252.)

§ 2. *Non-malignant Tumours of the Iris.*

Fig. Dalrymple, Pl. XXXI. *figs.* 1—3. Ritterich, Pl. I. *fig.* 5.

The non-malignant tumours of the iris, which I have seen, are of two kinds, the one encysted and the other solid.

1. In one case, I saw a cyst form in the iris in consequence of a wound. It was semitransparent, and apparently filled with a thin fluid, but as it was not increasing in size and gave no pain, it was not interfered with.

Case 629. — A lady was affected with considerable pain in one of her eyes, which presented the appearance of a small vesicle pushing into the anterior chamber from under the ciliary margin of the iris behind the lower edge of the cornea. The vesicle gradually increased, separating the iris more and more from the choroid, and the pain became severe. I punctured the vesicle, or encysted tumour, with the iris knife through the cornea. A minute quantity of fluid was discharged from the cyst, which immediately contracted so much that it was no longer visible. The pain was removed. The wound made in the cyst healed; it filled again with fluid, and

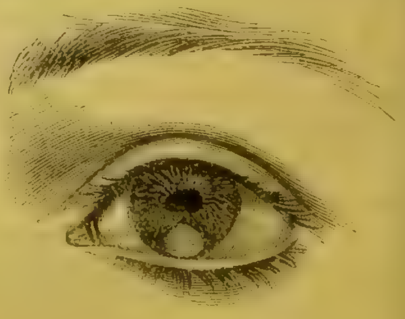

Fig. 70.

again appeared (*Fig.* 71.) in its former situation, but larger than before. I punctured it a second and a third time, at intervals of six and eight weeks. After the third puncture, it did not fill again. The iris returned to its natural place; the pain ceased entirely; and vision was preserved.

The notion which I adopted of this case, at the time, was, that the cyst had formed in the posterior chamber, and had come into view by pushing itself between the edge of the iris and that of the choroid; but I now regard Mr. Bowman's view as the correct one, that the disease is a morbid formation of fluid between the iris and its posterior epithelium, commonly called the uvea.

"This disease," says Mr. B., "is not accompanied by any other, is of slow growth, and appears first as a bulge of a portion of the iris towards the cornea. I imagine that the first formation of the fluid is attended with a swelling of the uvea backwards towards the suspensory ligament and lens; but, as the contact of these resisting parts must very speedily arrest any further advance in that direction, the accumulating fluid next begins to push forward the proper tissue of the iris, which separates it from the anterior chamber. There it meets with less resistance. The highly extensile fibres of the iris slowly yield, until in the course of months they bulge to a large extent before the fluid, and come into contact with the cornea, and that sometimes so widely as to throw the pupil towards the opposite side, and even to put it out of sight, by becoming rolled in front of it. . . . . If the cyst be punctured in front, the transparent contents are ejaculated with force by the undiminished contractility of the distended iris; and in the course of a few minutes, there remains no trace of the pre-existing disease, the iris having in all respects resumed its natural aspect. The cavity, however, is apt to refill more than once."[1]

The practice to be adopted in cysts of the iris, is to puncture them through the cornea.[2] Should this plan fail, after being repeatedly tried, the cornea will require to be opened to a considerable extent, the front of the tumour laid hold of with Schlagintweit's hook or the canular forceps, drawn forth through the wound of the cornea, and snipped off. No attempt should be made to extract the whole cyst.

Akin to the cases just spoken of appears the following, recorded[3] by Mr. Turner, of Keith.

Case 630.—A woman, aged 62, presented herself with an encysted tumour, projecting through the pupil, and causing severe inflammation. It formed a semi-transparent membranous-like bag, and occupied the greater part of the anterior chamber. Mr. T. punctured it through the cornea; the contents escaped into the aqueous humour, and the cyst collapsed.

2. The solid tumour of the iris is distinctly described by Delarue[4], under the head *Des Excroissances charnues de l'Iris,* and numerous cases of it are recorded. It appears to be, in general, a scrofulous tubercle. The iris generally becomes first of all whitish at some particular part of its extent, and then rises into a tumour, which assumes a yellowish colour, with red vessels ramifying over it. Sometimes such a tumour suppurates, and bursts through the sclerotica, after which the eye becomes atrophic.

Case 631.—A pale, weakly, female child, seven or eight years of age, labouring under caries of the left foot, was brought to Dr. Ritterich, on account of a complaint in her right eye. Along with slight intolerance of light, and moderate redness of the conjunctiva, he found a white elevation at the pupillary edge of the iris, but not entirely embracing it. The iris, everywhere else contracted, was at this place dilated, and the pupil immovable. The patient did not see with this eye, and complained now and then of pain in it. After a time, the swelling extended to the ciliary edge of the iris, and also approached closer to the cornea. Dr. Ritterich at first considered the disease an abscess; but he found, on attempting to evacuate it through the cornea, that it was a fungous excrescence of the iris. For a long time after this, he did not see the patient; and when he did see her, he found the tumour much increased; so that, fearing it might implicate the whole organ, he proposed to remove the front of the eyeball. But the patient was not brought back to him for a year, when he found the eyeball atrophic, and instead of the cornea, a thick cicatrice. The health of the girl was improved, and her foot so well that she could walk; several pieces of bone had come out of it. The mother said that the cure took place spontaneously.[5]

Case 632. — On the inferior part of the iris, in a boy about three years old, a small patch of lymph was deposited. The pupil was not influenced by it, but moved as usual. There was no ophthalmia, nor any irritability to light. In a fortnight, the mass of lymph was so much increased, that it occupied the inferior half of the anterior chamber. A process of organisation now commenced in the lymph, and an action analogous to inflammation was set up in the cornea. It became turbid and vascular; the iris and cornea united; a blue mass arose in the situation of the ciliary ligament, which, together with the whole of the cornea, ulcerated or suppurated, and an ill-conditioned and very luxuriant fungus shot forth. By degrees the fungus diminished, and finally the eyeball healed.[6]

Case 633. — In a boy, about eight or nine years of age, Mr. Lawrence saw an apparently simple vascular growth, of a light brown colour, equal in size to a small pea, proceeding from the iris, without much redness or pain, and without opacity of the pupil. It caused ulceration of the cornea, and thus appeared externally. As the patient was removed to his residence in the country, Mr. Lawrence did not witness the termination of the case; but he was informed that the tumour subsided after a time, and that the eye shrunk.[7]

Case 634. — Sarah Macniven, aged 19, was admitted at the Glasgow Eye Infirmary, 17th February, 1835. About five weeks before her admission, her left eye had been considerably inflamed, with pain in the eye and circumorbital region. The conjunctiva and sclerotica were injected with blood, the cornea slightly nebulous, the iris somewhat changed in colour, vision very imperfect, and the motions of the pupil sluggish. At the bottom of the anterior chamber, there was a yellowish mass, having much the appearance of pus, with reddish streaks, as if from blood-vessels, passing over its surface. This yellowish substance gradually increased in size, and assumed the appearance of a scrofulous tubercle. It caused an elongation of the cornea downwards, so that the cornea had an oval shape. The tumour diminished considerably, and the inflammatory symptoms subsided, under the internal use of mercury, quina, and belladonna. The patient was now seized with insomnia, spectral illusions, delirium, and loss of motion of the right arm. She died on the 11th April. Permission could not be obtained to inspect the body; but it is not improbable that other scrofulous tubercles existed within the cranium, similar to the one attached to the iris.

Case 635. — Maître-Jan relates the case of a soldier, whose eye was completely covered by a fleshy excrescence, which he compares to a mushroom, and which projected even from between the eyelids. He destroyed it by the repeated application of one part of corrosive sublimate with four of dry crust of bread, after which he discovered that its root was narrow, forcing its way through an ulcer of the cornea, and arising from the iris. Under the continued use of escharotics, the front of the eye sloughed, and the lens and vitreous humour were evacuated, after which the pain ceased, and the ulcer cicatrized.[8]

§ 3. *Non-malignant Tumours of the Choroid and Corpus Ciliare.*

The posterior part of the choroid is sometimes the seat of a tumour, which is probably of the nature of scrofulous tubercle, or of fibroplastic tumour. It separates the membrane into two laminæ, between which it is deposited. Much more frequently have non-malignant growths been observed in the anterior part of the choroid.

Case 636. — A child, about six years old, came under Mr. Lawrence's care at the London Ophthalmic Infirmary, with external inflammation of one eye, attended with so much swelling of the palpebræ, that the exact state of the globe could not be ascertained. Heat of skin, quickness of pulse, furred tongue, great pain in the head and eye, restlessness, and want of sleep, showed the local inflammation to be serious. At the end of three or four days, after the use of leeches and suitable internal means, Mr. Lawrence succeeded in obtaining a view of the eye, in which there was vivid external redness, with a dull state of the cornea; the iris was pushed forward, and the pupil partially opaque. In spite of antiphlogistic means, the child continued to suffer. A tumour gradually arose behind the edge of the cornea; it was of a yellowish colour, and acquired the size of a horse-bean. Subsequently, two or three other projections took place, of smaller size, arranged with the first, in a regular series, at a short distance from the margin of the cornea. The inflammation still continued severe, although leeches and aperients were frequently used. At length the inflammation abated, the pain became less, the protuberances diminished in size, the cornea shrunk completely, the eye became atrophic, and the child recovered without any farther ill consequences.[9]

Case 637. — A girl, about ten years old, was brought to Mr. Saunders, for the purpose of obtaining an opinion whether she was blind. Of that there was no question, as the affected eye gave no sign of vision.

The sclerotica was unusually vascular, but not inflamed. The vessels were large and serpentine. The iris seemed to be twice as far from the cornea as is natural. The pupil was dilated, and the iris contained many distinct red vessels. The cornea, with the aqueous, crystalline, and vitreous humours, was at this time transparent. In the course of a few weeks, the crystalline became opaque, and the iris, covered with lymph, and as red as if injected, advanced towards and touched the cornea. Shortly after, a blue excrescence was thrown out at the superior part of the eye, at that part of the sclerotica which unites with the ciliary ligament. It increased rapidly, and became as large as the anterior portion of the globe. It ulcerated, and for a long time a thin watery fluid was discharged, then pus, and ropy lymph. After some months, the aperture closed; the eyeball, much reduced in bulk, became tranquil, and even retained some vestiges of the cornea, the blue excrescence being totally extinct. During this process, there was nothing like acute inflammation, and the pain was very trivial.[10]

Case 638. — A scrofulous child had scrofulous ophthalmia for a year, with an ulcer at the lower edge of the cornea, which gave way. Through the opening, a hard, irregular, reddish-white swelling gradually protruded. Atrophy of the bulb and tabes mesenterica supervened about the same time, and soon after sub-acute hydrocephalus.

The eye was examined by Jäger, who ascertained that the disease arose from the corpus ciliare, and that the other textures, although atrophied, were not connected with the tumour, which had spread outward, between the iris and cornea.[11]

Case 639. — A woman, aged 40, of arthritic diathesis, applied to Professor Rosas, on account of a fungus in the anterior chamber, which appeared to arise from the ciliary processes, and involved a third of the iris. The rest of the iris, with its pupillary edge, was healthy, as well as the other textures of the eye. With the extraction knife a flap was formed in the external inferior part of the sclerotica, about half a line from the edge of the cornea, and the fungus cut out, along with which came the lens and a portion of the vitreous humour. In some weeks the wound was healed, the cornea remained flattened, and at its inferior external part, nebulous; looking downwards into the eye, the pupil was observed dilated, vision was confined to a mere perception of light, and no trace of the growth remained.[12]

§ 4. *Non-malignant Depositions or Tumours occupying the place of the Vitreous Humour.*

Fig. Dalrymple, Pl. XXII. *fig.* 6.

It may now be regarded as a generally received opinion, that frequent instances occur of changes of structure deep in the eyeball, producing many, if not all, of the visible appearances of fungus hæmatodes of the eye; but which do not turn out to be malignant. Such cases are not uncommon after injuries. They constitute a diseased state of the eye, which Beer included, along with other conditions of the deep-seated parts of the organ, of a nature totally different, under the name of *Amaurotic cat's eye.* Traumatic cat's eye is the appellation given to such cases, when they are evidently the result of an injury. To distinguish them, not only from malignant tumours, but from posterior hæmophthalmus and sub-choroid dropsy, will require very great attention. (See p. 693, 700.)

The injuries which are apt to be followed by the appearances referred to, rarely penetrate through the tunics. I have known a blow on the eye, or a cut of the conjunctiva, to produce this affection. After pretty severe inflammation of the conjunctiva and sclerotica, the sight grows dim, while behind the pupil, sometimes on the opposite side of the eye from that which was injured, sometimes in the fundus of the eye, a whitish or yellowish-red deposit makes its appearance, the result of lymphatic effusion between the choroid and retina, or between the retina and the hyaloid. After a time, cataract follows, and subsequently the eye shrinks.

If we extirpate such eyes, under the notion that they are affected with fungus hæmatodes, the patient will continue well, and we shall fall into the error of supposing that our operation has been an exception to the general failure which attends the removal of the eye in that disease. This error has probably been committed by Mr. Wishart[13] and by Mr. Porter[14], in two cases which have been given to the public. In Mr. Wishart's case, the disease in the eye arose from a blow; in Mr. Porter's case, the fungus was partially contained in two cysts; in both cases, the optic nerve was sound; all of which circumstances lead me to suspect that they were not cases of fungus hæmatodes. In the Second Edition of this Work, printed in 1834, I stated that, in the case of an adult, whose eye I had extirpated four years before, there had been no return of fungus hæmatodes. The patient referred to continued well during the rest of her life, which extended to twenty years beyond the date of the operation; but a re-examination of the extirpated eye, and a comparison of the symptoms with those of some non-malignant cases which I have since seen, or of which I have read, have led me to regard the case as certainly not one of fungus hæmatodes. The facts that one of the fungous masses had been developed in the substance of the choroid, and that, the other, which occupied the place of the vitreous humour, and was attached to the termination of the optic nerve, was contained within a distinct firm cyst, have led me to this change of opinion.

Mr. Lawrence states that he had seen children with the appearances of fungus hæmatodes in the first stage; namely, the altered colour of the pupil, the metal-like reflection in the bottom of the eye, and so on. The uniformly unfavourable result of extirpation deterred him from proposing the operation. Yet, in some instances, very contrary to his expectation, the case has remained for some time in the state just now mentioned, and afterwards the eye has shrunk and become atrophic.[15]

Mr. Travers, also, has published some important observations on the difficulties attending the diagnosis of fungus hæmatodes. He is of opinion that the tapetum-like appearance at the bottom of the eye, in the early stage, cannot be relied on as diagnostic. He mentions that he had seen several cases, in which this appearance was stationary for a time, after which the eyeball dwindled, so that they might fairly be presumed not to have been instances of malignant disease. It so happened, however, that long-continued alterative courses of mercury, or protracted salivations, had been used in these cases, so that the fact of their disappearance was consequently open to another explanation; namely, that they were examples of malignant disease which had been arrested by this treatment. That the appearance in these cases was very analogous to that of medullary tumour, we may readily admit from the fact, that in one of them, Mr. Travers being about to extirpate the eye, the operation was over-ruled, only by one dissentient voice, at a consultation including some eminent members of the profession. Several years before Mr. Travers published this statement of her case, the patient had recovered with the loss of sight, and still continued in perfect health.

It accords exactly with my own experience, that inflammation of the internal structures of the eye, arising in consequence of an injury, not unfrequently terminates in a deposite, apparently of lymph, which in all probability undergoes vascular organisation, and which certainly presents an appearance, deep in the eye, closely resembling incipient medullary tumour. The first case of this kind which fell under my observation, occurred in 1815, the inflammation being the consequence of a blow, on the eye of a child, with a snow-ball. In some of the cases in question, I have observed that the ciliary edge of the iris appears wrinkled, the larger circle is drawn somewhat backwards, while the smaller circle projects forwards, and is broader than usual; the pupil is in a middle state of dilatation, and its edge is fringed with uvea; the surface of the deposition or tumour at the bottom of the eye is sometimes of a pale tint, sometimes yellowish or reddish, and not so defined as in the malignant cases. The deep erect image of the candle is greatly magnified by such deposites, which evidently act on it as a foil. In some cases, points of suppuration form through the sclerotica and conjunctiva, most frequently below the lower edge of the cornea. After bursting, a fleshy fungus projects, then shrinks; and the eyeball becomes atrophic.

Mr. Travers states that in a young lady's eye, the fawn-coloured resplendent surface, with red vessels branching over it, was so strongly marked, that he should certainly have considered it to be the nascent malignant disease, but for the circumstance of its having followed a wound with a pair of fine scissors, a fortnight before. The instrument had passed obliquely between the margin of the iris and the ciliary body. Deep-seated inflammation ensued, and blindness, after three days, became complete. The lens remained transparent for months, so as to permit the appearances described to be observed. At length, a cataract, with constricted pupil, ensued upon the chronic inflammation of the iris; and the eyeball, which had never enlarged, gradually shrunk.

From what I have observed of non-malignant growths within the eye, I am disposed to conclude that appearances resembling those of medullary fungus, may always be regarded as doubtful when they arise from an evident wound or injury, or when they follow or are combined with scrofulous affections of other organs.

Mr. Travers remarks that either hydrophthalmic enlargement, or, on the contrary, shrinking by interstitial absorption of the contents of the eyeball, is a sure indication that the disease is not malignant.[16]

Case 640. — Agnes Campbell, aged 12, was admitted at the Glasgow Eye Infirmary, on the 26th December, 1833. Six days before that date, a mixture of sulphuric acid and water, with particles of broken glass in it, had been projected against the left eye. There was an irregular cicatrice towards the inner angle of the eye, about two lines and a half from the margin of the cornea, which looked as if it had been produced by a fragment of the glass. No roughness could be felt on examination with the probe, nor any breach of continuity of the sclerotica. She was unable to discern any object with the injured eye, which retained merely a faint perception of light. The pupil was in a middle state of dilatation ; but contracted momentarily on sudden exposure of the sound eye to light, and then speedily returned to its former state. The conjunctiva was red. The iris was wrinkled toward its ciliary edge, and had assumed a reddish tinge. The pain was very trifling. Leeches were applied, and calomel with opium was ordered.

For some time the inflammation increased, and then diminished. By and by, the bottom of the eye presented a glaucomatous appearance. On the 13th January, 1834, the eyeball was found to be shrunk, and charged in form by the action of the recti ; the pupil presented a greenish yellow hue ; and there was an appearance as if the retina was pushed forward, from the side on which the eye had been wounded. At last, a bright reflection from the bottom of the eye, of a whitish-red colour, was evident, very similar to what occurs in incipient medullary fungus, while a grayish-white matter was seen to be deposited a little behind the iris, towards the nasal side of the eye. The eye continued to shrink ; notwithstanding which, the patient still retained the power of perceiving light and shadow with it. In the course of some months, the lens became opaque.

Case 641. — Charles Kelly, aged 11, was admitted at the Glasgow Eye Infirmary, on the 27th September, 1832. The right conjunctiva and sclerotica were injected, the cornea somewhat hazy, the pupil dilated and fixed ; the colour of the iris had changed from bluish-gray to yellowish brown ; several spots near the external circumference of the iris were of a blood-red colour ; the anterior chamber was enlarged, and the iris, turned back ; vision appeared to be extinct. On examining the bottom of the eye, a tawny appearance presented itself, exactly similar to that which attends the incipient stage of medullary fungus.

Eight months before applying at the Eye Infirmary, he had had a fever, after which his mother observed that he could not read long at a time, and she thought he had a weakness and giddiness in his head. He had also been troubled with frequent vomiting. The diseased appearances in his eye, however, had been noticed only 10 days before coming to the infirmary, four days previously to which he had been much terrified by being exposed to a storm of thunder and lightning, and was immediately afterwards attacked with pain in the right side of his head.

Neither Dr. Rainy, Mr. Nimmo, nor myself felt any hesitation in pronouncing this to be a case of medullary fungus. We recommended extirpation of the eye, but to this the mother would not consent. Calomel with opium was administered.

On the 29th September, the eye appeared less irritable, and he had rested better ; but the tawny reflection from the bottom of the eye was more distinct.

On the 10th November, the vascularity of the conjunctiva appeared to have increased, the eyeball was enlarged, and presented a considerable prominence towards the inner canthus ; the anterior chamber was diminished in size by the iris bulging forward, while the lens was seen projecting through the pupil, so as to touch the cornea.

On the 21st, the ball of the eye was so much increased in size, that the lids could not be brought together. The prominence above mentioned was now more pointed, and the cornea seemed falling into a state of ulceration.

By the 31st December, the prominent point on the nasal side of the eye had given way, and discharged a quantity of thick purulent matter. The cornea had become opaque, and was much reduced in size. Before this time, a scrofulous enlargement of the left ring-finger was observed.

By the 1st June, 1833, the eye had shrunk so much, as to allow the lids to close over it. The pus discharged had been considerable, but was now diminishing.

The remaining part of the globe presented a granular appearance, of a reddish-brown colour.

By the 7th April, 1834, the lids were very much collapsed, from the extremely atrophic state of the eyeball. The finger had burst, and discharged curdy pus. On introducing a probe, caries was detected.

Case 642. — A boy, about 10, came under Mr. Lawrence's care at St. Bartholomew's Hospital, in consequence of a wound in the eye, three or four days previously. The point of a table-fork, which had been thrown at him by his sister, had passed through the upper eyelid and the cornea. The eye was inflamed and painful, and the pupil was occupied by a thin grayish film, which Mr. Lawrence supposed, on the first cursory inspection, to be opacity of the lens, caused by the accident. The use of leeches and other antiphlogistic measures lessened the inflammation, and removed the opacity from the pupil. The inflammation, however, recurred, and soon after a bright yellow appearance was seen, which gradually extended over the whole fundus of the globe. The iris was changed in colour; the pupil was fixed in the middle state, and clear; vision extinct. In a short time, the globe felt soft, and began to shrink; atrophy was considerably advanced, when the lens became opaque, and completely concealed the change in the back of the eye; the globe became completely atrophic.[17]

Pathological Anatomy.—It is to be hoped, that attention being roused to the fact, that there are various disordered states of the interior of the eye, which simulate the disease called fungus hæmatodes, an accurate examination will be instituted into their nature, by those who may have opportunities of dissecting eyes so affected, either after extirpation, or after the death of the patient.

It is probable that, in some cases, an effusion of blood, lymph, or pus, into the vitreous cells, on the surface of the retina, or between the retina and the choroid, will be found to be the whole cause of the appearances, especially when these have quickly succeeded to injuries of the eye; while, in other instances, scrofulous or other tubercles will be found growing from the optic nerve, imbedded in the choroid, or adherent to some of the other textures. In such cases, the optic nerve, beyond the eye, will probably be found healthy, or shrunk; whereas, in fungus hæmatodes it is generally thickened and diseased.

Mr. Travers extirpated the eye of an infant, eight months old, the disease being supposed to be malignant fungus in its nascent state. Upon making a section of the eye, the cells of the vitreous humour were found to be filled with an opaque lardaceous substance. The child grew up to be a healthy boy, and the other eye remained sound. It is evident that an opaque lardaceous substance, or one resembling curd, or ground rice boiled, all of which comparisons are made use of by Mr. Travers[18] in speaking of the contents of the vitreous cells, denotes a morbid state altogether different from that which exists in fungus hæmatodes.

The following case was published[19] as one of fungus hæmatodes; but the dissection discloses morbid appearances quite distinct from those which exist in genuine examples of that disease. They approach evidently to what Mr. Travers had met with, in the case just now referred to.

Case 643. — A boy, under the care of Mr. Wardrop, two years and eight months old, became dropsical, and died after having been twice tapped.

It had been remarked, some weeks previous to his decease, that there was a peculiar appearance in the left eye; the bottom of the vitreous chamber having a metallic lustre, produced by a yellowish opaque body.

On dissection, a sac was found, adhering to the peritonæum, and containing a large quantity of puriform fluid, mixed with serum. The sac was formed by the separation and thickening of the two laminæ of the great omentum. There was another cyst between the two laminæ of the lesser omentum, containing about a pint of similar fluid.

The optic nerve of the affected eye was perfectly similar to that of the opposite side, from the thalamus till it entered the globe. The consistence or density of the sclerotica was not perceptibly altered. The choroid coat appeared rather paler than natural; and being lacerated at one point, during the dissection, a quantity of a creamy fluid escaped. On turning back the choroid, the vitreous chamber appeared filled with an opaque white mass, on the anterior part of which lay the crystalline lens. By immersion in spirits, the retina was rendered more opaque than the new production, and was found of its natural appearance, and enveloping the diseased growth. The hyaloid membrane also surrounded the tumour, and had become opaque in a few points where the diseased production was found firmly adherent to it. This presented a mass consisting of granules, or lobules, united by fine reticulated membrane. It seemed to have commenced at the point where the optic nerve pierces the sclerotic; at least, it was connected to that point by a small pedicle, which was continuous with the larger mass attached to the hyaloid membrane, the structure of the whole being perfectly identical; viz., small granules, about the size of a millet seed, connected together by reticulated membrane.

The disease, which, in the following case, destroyed the retina and the vitreous body, and simulated fungus hæmatodes, appears to have been posterior hæmophthalmos.

Case 644. — In the left eye of a child, five months old, Mr. Critchett found the conjunctiva and sclerotica congested, the surface of the iris dull, and the anterior chamber rather diminished in size by the bulging forward of the iris. He treated the case as one of scrofulous iritis, for about a month, without any improvement. A complete change, however, soon afterwards appeared; the sclerotica became thin and dark-coloured, while a yellow shining mass, gradually advancing from the posterior part of the globe, expanded the pupil, and pressed the lens against the cornea. The case was presumed to be one of medullary tumour, and the eye was extripated. No untoward symptom followed; and three months afterwards, the child was steadily improving in general health.

On laying open the diseased organ, which was not enlarged, the following state of parts was found to exist:—Immediately behind the cornea lay the iris, and immediately behind this the lens, both so close to the posterior surface of the cornea as almost to obliterate the aqueous chambers. The anterior half of the lens was transparent, the posterior half slightly opaque, while its posterior surface presented, near its centre, a small nodular swelling, applied against a fibro-vascular membrane, yellowish, opaque, smooth, and glistening, inseparably connected to a gelatinous mass behind it, which consisted of the textural elements of the retina broken up, and variously modified. The ciliary processes were thrown backwards. The remaining cavity of the globe was occupied by a grumous albuminous fluid, which lay in contact with the choroid, no hyaloid, nor expanded portion of retina, being visible. The fluid had suspended in it, blood-corpuscles, fat granules, disintegrated cells, exudation corpuscles, pigment cells, and a few delicate ciliated epithelial cells. The optic nerve, where it passed through the sclerotic, and for some way behind that point, was atrophied. Hæmorrhage from the choroid must in this case have forced the retina away from the optic nerve, and pushed it towards the lens. The débris of the choroid must have furnished some of the elements found in the fluid which occupied the place of the vitreous humour.[20]

Non-malignant tumours may not only assume a formidable appearance and destroy the organ, but from their size and dangerous effects render necessary the extirpation of the eye. In general, however, the affected eye becomes atrophied, and gives no further trouble.

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[1] Lectures on the Parts concerned in Operations on the Eye; p. 75; London, 1849.

[2] See Case by Dalrymple, cured by thrice puncturing; Lancet, August 31, 1844; p. 713: Case by Wharton Jones, in which the cyst suppurated after being twice punctured; Ib. June 12, 1852, p. 568.

[3] Monthly Journal of Medical Science; Vol. i. p. 270; Edinburgh, 1841.

[4] Cours complet des Maladies des Yeux; p. 206; Paris, 1820.

[5] Ritterich, Jährliche Beiträge zur Vervollkommnung der Augenheilkunst; Vol. i. p. 37; Leipzig, 1827.

[6] Treatise on some Practical Points relating to the Diseases of the Eye, by J. C. Saunders, p. 119; London, 1811.

[7] Treatise on Diseases of the Eye, by W. Lawrence, p. 593; London, 1833.

[8] Traité des Maladies de l'Œil, p. 456; Troyes, 1711.

[9] Op. cit. p. 591.

[10] Op. cit. p. 117.

[11] Canstatt über Markschwamm des Auges and amaurotisches Katzenauge; p. 78; Würzburg, 1831.

[12] Handbuch der theoretischen und practischen Augenheilkunde, von Anton Rosas; Vol. ii. p. 617; Wien, 1830.

[13] Edinburgh Medical and Surgical Journal; Vol. xix. p. 51; Edinburgh, 1823.

[14] Dublin Journal of Medical Science; Vol. ix. p. 263; Dublin, 1836.

[15] Lectures in the Lancet; Vol. x. p. 518; London, 1826.

[16] Observations on the Local Diseases termed Malignant, by Benjamin Travers; Medico-Chirurgical Transactions; Vol. xv. p. 235; London, 1829.

[17] Op. cit. p. 617.

[18] Op. cit. pp. 202. 400; Pl. iii. fig. 7.

[19] Lancet, Vol. xi. p. 87; London, 1827.

[20] Lancet, March 4, 1854, p. 242. For some additional particulars of this case, I am indebted to Mr. James Dixon.

CHAPTER XVII.

MALIGNANT AFFECTIONS OF THE EYEBALL.

The eyeball is subject to at least three malignant affections; namely, *scirrhus*, *encephaloid tumour*, and *melanosis.* We draw our descriptions from insulated cases of these affections; but it is important to know, that they may be conjoined.

Leaving out of view, for the present, the last enumerated, I am led, from what I have seen of the other two malignant diseases of the eye, to say, that the first is slow in its progress; never ends in a tumour of a large size; and, upon extirpation, so far from presenting any thing like a fungus, or like medullary substance, is found so extremely firm, and of such a fibrous or striated texture, as to merit the name of scirrhus. This degeneration of the eye I have never met with, except in persons advanced in life, and more frequently in women than in men.

In the second of the three diseases above named, the tumour, after bursting through the fore-part of the eye, advances with great rapidity, and often reaches an enormous size; it presents a spongoid or fungous texture, becomes attended at last by frightful hæmorrhagy, and is found, on dissection, to consist of a brownish-white substance, almost entirely destitute of fibres, and which may be compared, in point of consistency and general appearance, to brain. This kind of tumour I have met with both in children and in adults, but much more frequently in the former.

Extirpation of the eye is sometimes attended with complete success in the first set of cases; although even in these there is a danger of scirrhus afterwards attacking the eyelids, the cellular substance of the orbit, or the muscles of the eyeball. In the numerous cases of the second kind in children, which have come under my observation, the operation of extirpation has never been attended by permanent success; a fatal reproduction of fungous excrescence from the optic nerve, has invariably followed in such subjects, and generally within the period of a few months.

SECTION I.—SCIRRHUS OF THE EYEBALL.

Fig. Dalrymple, Pl. XXXV.

Scirrhus of the eyeball is always preceded by long-continued inflammation in the eye, originating in many cases from cold, supervening in females about the time of life when menstruation ceases, attended by racking pain in the eye and head, and soon followed by dimness of sight, and at length by total blindness in the eye affected. To these symptoms we find that there has succeeded a deformed and indurated state of the eye; the cornea having become opaque, misshapen, and shrunk; the sclerotica of a dingy-yellow colour, and irregularly prominent; the external blood-vessels varicose; and the conjunctiva sometimes thickened, or even tuberculated. The eye is affected with sensations of itchiness, burning heat, and lancinating pain, overflows with tears on the least exposure, and is unable to bear the slightest touch. Severe hemicrania, aggravated during the night, totally prevents sleep, deprives the patient of all desire for food, and renders him unfit for any continued employment of body or mind. One of the most remarkable characteristics of the disease is the length of time during which it may continue without affecting the neighbouring parts, or advancing to ulceration. At last, however, the eyelids and areolar tissue of the orbit are involved in the carcinomatous inflammmation; the lids become swollen, red, and indurated; the eyeball is no longer capable of motion; and the lymphatic glands of the face and neck become enlarged and painful; the conjunctiva begins to ulcerate, discharging a thin acrid matter; the ulcer spreads and grows deep; and one part after another being destroyed, as in cancer of the eyelids, the patient is gradually worn out by fever, pain, and anxiety.

If the eye is extirpated before the disease is allowed to proceed to such a length, the sclerotica, especially near the optic nerve, is found greatly thickened, hard, almost cartilaginous, and on being divided with the knife, presents the whitish bands, which are deemed diagnostic of scirrhus; the muscles of the eye are similarly affected; the eyeball itself is misshapen, in some cases shrunk, in others enlarged; its natural contents are absorbed, or if any of them remain, they are with difficulty recognised; while a whitish or yellowish substance, of less firm consistence than the diseased sclerotica, but, like it, divided by membranous septa, occupies the place of the vitreous humour.[1]

Prognosis and treatment.— Neither any internal medicine, nor external application, appears to have the slightest power to arrest the progress of the disease. Its nature is intractable; but from the slowness of its course, years may elapse before it proves fatal.

In the early stage, that is to say, so long as the disease appears to be confined to the globe of the eye, and this remains moveable in the orbit, extirpation ought to be had recourse to, and may be urged as a means likely to be successful. If the conjunctiva, eyelids, or orbital tissues be in any degree affected, removal of the parts cannot be so confidently recommended, on account of the liability of the disease to return. Still the operation ought to be adopted, unless we have reason, from the completely fixed state of the eyeball, strongly to suspect that its muscles, the ocular capsule, the whole areolar tissue of the orbit, and perhaps even the periosteum, are involved in the scirrhous degeneration.

Should the patient refuse to submit to extirpation of the eye, or should it appear to the surgeon, either from the state of the general health, or the advanced stage of the local affection, that it would be improper to propose an operation, palliatives must be used to mitigate the pain, and lessen the constitutional disturbance. Much may be done in this way by careful attention to the state of the bowels, the observance of a mild and nourishing diet, and the avoidance of whatever fatigues the body or irritates the mind. Narcotics are to be had recource to, first of all externally, as in fomentation and the like; and should such applications fail, opium may be administered in clyster, or by the mouth. In advanced cases of ulcerated cancer of the eye, large doses of the preparations of opium are necessary, to relieve the sufferings of the patient.

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[1] On the microscopic characters of scirrhus, see Paget's Lectures on Surgical Pathology; Vol. ii. p. 297., London, 1853.

SECTION II.—FUNGUS HÆMATODES, OR ENCEPHALOID TUMOUR OF THE EYEBALL.

Fig. Ammon, Thl. I. Taf. XXI. XXII. Dalrymple, Pl. XXXIII. XXXIV. XXXVI. *fig.* 1.

The disease described by Professor Burns[1], under the appellation of *spongoid inflammation*, afterwards by Mr. Hey[2], under that of *fungus hæmatodes*, and which has been known also by the names of *soft cancer*, *medullary sarcoma*[3], and *encephaloid tumour*, not unfrequently attacks the eyeball. A case of this kind was dissected[4] by Paw, in 1597. The tumour of the eye was as large as two fists, and was attended by another tumour on the side of the head. The substance of the tumours, Paw compares to brain. A case of this disease, in which the eye was extirpated by Mr. Hunter, was published in 1767.[5] Mr. Ware, in 1800, viewing the disease as carcinomatous, published[6] a case, in which both eyes of a child were affected. Mr. Hey expressed an opinion, that fungus hæmatodes not unfrequently affected the globe of the eye, causing an enlargement of it, with destruction of its internal structure; and that if the eye were not extirpated, the sclerotica burst, a bloody sanious matter was discharged, and the patient sunk under the complaint.[7] Mr. Wardrop proved[8] by numerous cases and dissections, that in this opinion Mr. Hey was perfectly correct.

Symptoms.—Fungus hæmatodes, or encephaloid tumour, arising within the eyeball, presents three stages. In the *first*, or incipient stage, the exterior form of the eye is unchanged, and the disease is perceived through the cornea and pupil. In the *second* stage, the form of the eye is altered, the organ enlarged, and its tunics ready to give way. In the *third*, or fungous stage, the eye has burst, and the tumour protrudes.

1*st Stage.* The iris has lost its natural colour, the pupil is somewhat irregular, slightly dilated, and immovable; and behind it, deeply seated in that part of the eye naturally occupied by the vitreous humour, a whitish or reddish-yellow appearance is observed, particularly when the eye is looked at from one side and at some distance, and when the patient turns it in certain directions. The light, especially when not strong, is peculiarly reflected from the bottom, or from one side of the eye, where the retina is, or ought to be, so that there is some resemblance between the eye in this state, and that of a cat or a sheep, in which the light is reflected from the shining tapetum of the choroid. The appearance in question is sometimes best seen in candle light, and is always rendered more evident by artificially dilating the pupil. By and by, it is evident, that this appearance, now become bright, like the reflection from the surface of a brass plate, and so remarkable as to attract the notice of the most casual observer, arises from the presence of a new substance at the bottom of the eye. Slowly, in the course of months or of years, this body is observed to be advancing towards the pupil (*fig.* 72.), which, in general, is now widely and irregularly expanded. At this point of its progress it has sometimes been mistaken for cataract, and attempts have been made to couch it.[9] The surface of the tumour, sometimes of a pretty deep orange hue, in other cases of a white pearl colour, is seen to be more or less irregular, sometimes divided into two or three distinct masses, and partially covered with the ramifications of the central artery of the retina. As it advances, the tumour presses the vitreous humour and crystalline lens before it; the former is absorbed, the latter presses in its turn the iris convexly forward; by and by, the lens becomes opaque, and is generally absorbed. Still more readily is the disease, at this period, apt to be mistaken for cataract, by one not much acquainted with eye-diseases. The fixed pupil and the iris bulging towards the cornea, might warn against this mistake. The tumour now touches the iris, and still advancing presses it into contact with the cornea. The iris loses more of its natural colour, and becomes of a grayish or yellowish brown. It separates here and there from the choroid, or is partially absorbed, allowing the tumour to be seen through the new openings.

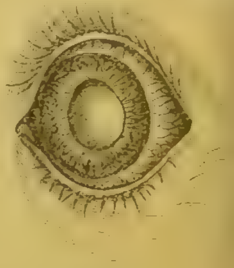

Fig. 71.
(From Ammon.)

When once it begins to shoot forward from the bottom of the eye, the tumour generally proceeds with rapidity. I have known it lie as if dormant, for nearly three years; but in a few weeks after commencing to advance, it not only occupied the whole cavity of the eye, but dilated it to twice its natural size, the first stage hurrying thus into the second.

The first stage is, in general, unattended by pain or external inflammation; but, in some cases, inflammation of the eye, with epiphora, intolerance of light, and headache, is the earliest symptom observable. In other instances, strabismus first attracts notice. The eye is blind from the first. I have known the disease treated for months as an ophthalmia, without its nature being once suspected.

2nd Stage. By the end of the first stage, the sclerotica around the cornea, has probably assumed a leaden colour; and the eye, fixed in the orbit, appears larger than natural, and feels harder to the touch. These symptoms soon become more decided, and are attended, from time to time, by smart attacks of pain, epiphora, and external inflammation. The cornea rapidly expands to perhaps double its natural diameter, and the iris almost disappears. The form of the eye is changed. It grows knobbed at one, or several places, the sclerotica becoming attenuated, and the tumour pressing outwards. Covered by the conjunctiva only, the tumour feels soft, appears white, and looks like a collection of pus, so that by the inexperienced, it may be taken for an abscess, and opened with the lancet. Sometimes, however, a suppuration does actually form in the interior of the eye; and bursting through the sclerotica and conjunctiva, gives relief to the pain which attends this stage. If the disease is not interfered with, and no suppuration forms, the conjunctiva becomes œdematous, and the eyelids swell. In some cases, the cornea can scarcely be brought into view, on account of the tumour pressing against the sclerotica, either at the temporal or nasal edge of the eye, and turning the cornea in the opposite direction. In other cases, the tumour advances into contact with the cornea, behind and in the substance of which matter is deposited. Becoming prominent, opaque, and vascular, the cornea ulcerates, and is ready to burst. As the eye enlarges, and undergoes the other changes now mentioned, the patient is subjected to severe fits of pain, chiefly in the forehead and in the neck. They are worse during the night than during the day, penetrate deep into the head, and cause delirium and fever.

3rd Stage. When the cornea gives way, a fetid, bloody, yellowish fluid is discharged, and the patient feels somewhat relieved. The lens also is discharged, unless indeed it has been absorbed. All appearance of an eye is speedily lost. The tumour, protruding through the ruptured cornea or sclerotica (in the latter case still covered for a while by the inflamed conjunctiva, which it pushes before it), grows with great rapidity, so that it is no longer capable of being covered by the eyelids, or contained within the orbit. The eyelids are everted, and stretched round the base of the tumour, which rests upon the cheek. Supplied by a great many blood-vessels, the coats of which are thin and easily ruptured, it assumes the appearance of a dark yellow or dark-red fungus, irregular on its surface, soft and spongy to the touch, readily torn, and bleeding profusely on the slightest irritation. Clots of extravasated blood form in the interior of the encephaloid mass. Extravasations, indeed, of this kind are apt to supplant almost the whole of the diseased structure, so that the name *fungus hæmatodes* now becomes more appropriate. The tumour ulcerates by times, and discharges a fetid sanies, which irritates and excoriates the surrounding integuments. Portions of the tumour die, blacken, and slough off from time to time; but the general bulk of the fungus is not at all reduced. On the contrary, it increases so as to distend the eyelids to an enormous degree, and even to dilate or destroy the orbit, making its way into the nostrils and antrum, and pressing directly on the brain, while the portion which projects upon the face, sometimes much exceeds the size of a man's fist.

The veins of the eyelids and forehead become varicose, and bursting, bleed profusely. The lymphatic glands of the cheek and neck enlarge, sometimes to a very great extent. In some instances, the opposite eye is protruded from its socket, by the pressure of the original tumour, while other tumours of the same character form under the scalp, and in the bones of the skull.

The patient cannot suffer the lightest covering on the tumour. He becomes affected with great constitutional irritation, restlessness, thirst, frequent vomiting, want of sleep, and disturbance of all the functions of the body; and at length expires, comatose or convulsed, exhausted by loss of blood, and worn out by hectic fever.

The duration of the disease is variable, the history of some cases extending to a few weeks only, while in others it embraces several years. The whole progress is slower in adults than in children. The second and third stages are much more rapid, in general, than the first. The first is often overlooked, till it suddenly passes into the second.

Pathological anatomy. — I have now before me an eye, extirpated by the late Dr. Monteath, during the first stage of this disease. Immediately after the operation, I divided the cornea and sclerotica by a crucial incision, and laid back the four flaps. The iris and choroid were entire. I divided them in like manner, laid them back, and along with the choroid I found that I reflected also the retina, which, though broken, and here and there deficient, is still sufficiently entire to give a white coating to the internal surface of the choroid, and has evidently nothing to do in this instance with the tumour, which occupies the whole space of the vitreous humour and crystalline lens, and springs from the optic nerve by a pedicle. The tumour, enveloped in a delicate membrane similar to the hyaloid, was of the consistence of brain, and of a yellowish-white colour. The optic nerve exterior to the sclerotica, did not appear diseased.

The subject from whom this eye was removed, was a child of about three years of age. In a few months after the operation, the orbit was filled with a new tumour, and the child soon after died. I carefully examined the parts, and have them now before me. The orbit was occupied by a diseased mass, sprouting from the stump of the optic nerve, and similar in texture to that which had formerly existed within the eye. I opened the cranium, and found the optic nerves, from their origin in the brain to their union, apparently healthy; but from their union to the optic foramen, the nerve of the diseased side was as thick as the middle finger. By passing through the optic foramen, it was constricted as if it had been surrounded by a ligature; but instantly on entering the orbit, it again expanded so as to fill the space between the recti. The tumour, covered by these muscles, filled the orbit so completely, that it still retains the pyramidal form of that cavity.

The appearances on dissection, in cases of fungus hæmatodes of the eye, are far from being uniform. They may all, however, be referred to the effects of a cancerous growth of the species denominated *encephaloid*, springing most frequently from the optic nerve. The blood-vessels which are seen on the surface of the tumour, in the first stage, are the branches of the central artery of the retina. From the first, the disease is a growth from the optic nerve, or from some other part, and not a deposite of fibrin, as Mr. Dalrymple thinks [10], becoming organised.

Although the retina was tolerably entire in the case which I have just related, in general it is so completely changed, that no part of it can be detected. In the case before me, the tumour had pressed forward from the end of the optic nerve, within the retina, in such a manner as to produce the complete displacement and absorption of the vitreous humour and crystalline lens; but in some cases, the tumour has been known to push itself between the sclerotica and choroid; while in other instances, the fungus has arisen from the optic nerve, before its entrance into the eye, and proved destructive to this organ, by pressure exercised on it from without.[11] It may even happen that there shall be several fungous growths, arising in succession, but latterly going on together, one perhaps behind the sclerotica, another between the sclerotica and choroid, and a third within the sphere of the retina.[12]

The sclerotica appears to suffer less, in general, from this disease than any other part of the eye.

The choroid is sometimes pushed to one side by the tumour, and on dissection, appears like an irregularly shaped bag, containing vitreous humour. In some cases, shreds merely of the choroid can be discovered, dispersed through the morbid growth. In other cases, portions of the choroid are increased to five or six times the natural thickness, and contain medullary fungous matter. Occasionally no trace of this membrane appears.

Mr. Travers tells us that medullary fungus may arise in any of the textures of the eye, with the exception of the crystalline lens and cornea. He had found it between the layers of the sclerotica. Although this is a much more frequent seat of melanosis than of encephaloid, I have seen the latter sprout from the junction of the cornea and sclerotica, the cornea and the interior of the eye being sound.

The humours are absorbed in proportion to the pressure of the tumour; and in cases where it has burst through the sclerotica or cornea, they are generally altogether destroyed.

I believe that, on minute examination, it will rarely be found that the optic nerve, exterior to the eye, presents a healthy structure. It will, in general, be found thicker than natural, softer, of a yellowish colour, and presenting, instead of bundles of nervous filaments interlaced together, as it ought to do, a uniform pulpy substance. In some cases, the nerve is found to be split into several pieces, the growth filling up the intervening spaces, surrounding the several portions of the nerve, and forming one connected mass with the morbid contents of the eyeball.

The diseased state of the nerve will in general be found to extend to that portion of it which is contained within the cranium; and in many cases the brain itself is affected, being changed into a soft pulpy mass, and presenting cavities, either in the substance of the part which has suffered the spongoid degeneration, or around it, filled with blood.[13] The disease in the brain seems secondary to that in the eye; but the affection of the brain may kill, before the eye is at all enlarged.

Greatly shrunk after death, and its dark red colour changed to a pale hue, the tumour varies in appearance in different cases; but has always more or less resemblance to the medullary substance of the brain, being in general opaque, whitish, homogeneous, and pulpy. It consists of cellular membrane, brain-like matter, consisting of microscopic cells and nuclei, and blood-vessels.[14] Like brain, it becomes soft when exposed to the air, mixes readily with cold water, and dissolves in it; while in alcohol or acids, it becomes firm, or even hard. When the softer parts are washed away in water, or when the mass is forcibly compressed, the more solid parts remain, and are found to consist of a filamentous substance, resembling cellular membrane. The consistence of the tumour varies, to a certain extent, in different cases, and in different parts of the same mass, being in some as fluid as cream, in others firmer than the most solid parts of a fresh brain. In some rare instances, gritty particles, probably bony, have been found interspersed through the morbid growth. The colour of the tumour, although commonly that of the medullary substance of the brain, or a very little darker, is sometimes redder, or even of a dark-brown colour, while, in the advanced stage, it often presents portions which nearly resemble clots of blood.

When the absorbent gland lying over the parotid, or any of the absorbent glands of the neck, are enlarged in this disease, they are found to be converted into a substance resembling in every respect that which composes the tumour of the eyeball and brain. In some cases, the glands ulcerate before death, forming very unhealthy sloughy sores; but most frequently the patient dies before the skin covering the glandular swellings is destroyed. Mr. Wardrop mentions, that after the skin covering such contaminated glands had given way, he never observed any fungus to arise from them.

In a case related by Mr. Saunders, this disease occurred first in one eye, and six months after, in the other also. I saw it, nearly equally advanced, in both eyes of a child. A similar instance is noticed by Mr. Stevenson.[15]

On examining the bodies of those who die of spongoid tumour of the eye, the same disease is sometimes discovered in the viscera of the abdomen or thorax; especially in the liver, kidneys, uterus, or lungs. The brain and the testicle are parts very subject to be attacked by it, and I have found it developed even in the walls of the heart. The eye is certainly the part of the body most liable to this disease.

Subjects.—Encephaloid tumour is much more frequent in children than in adults. Out of 24 cases which had come to Mr. Wardrop's knowledge, 20 of them occurred in subjects under 12 years of age.

The greatest number of cases has been observed in children from two to four years old. Sometimes the disease has been met with, within a few months after birth. In one case, I saw it in an infant nine weeks old. The mother had observed it six weeks before; so that it probably was congenital. Instances have happened, on the other hand, in which it has attacked adults, or even persons far advanced in life.

The children who fall victims to this disease are generally of a well marked scrofulous constitution, or belong to scrofulous families. Mr. Dalrymple remarks[16], that in the first stage of the disease they generally appear very healthy. He thinks, that the health falling off, the disease consequently makes progress; but the opposite hypothesis seems more likely to be true,—that as the local affection slowly and insidiously grows in the eye and within the cranium, the general health fails.

Exciting causes.—In many of the cases on record, a blow on the eye is mentioned as having preceded, and apparently excited, this disease. It may be doubted, however, whether the blindness of the affected eye does not render the children more liable to meet with blows on that side, after which the eye, being examined, may be found to present symptoms which had previously existed, but without attracting attention.

Diagnosis.—I have already (page 707) had occasion to speak of the difficulties attending the diagnosis, in the early stage of medullary tumour. In the fungous stage, it is apt to be confounded with exophthalmia arising from the pressure of enlarged lacrymal gland, or of encysted or other tumours in the orbit, from severe inflammation of the orbital cellular membrane, or even from ophthalmitis.[17] A deep transverse section from the outer to the inner canthus of the enlarged eye, so as completely to evacuate its contents, is an efficient remedy in simple exophthalmia, that is, protrusion and disorganisation of the eyeball originating from an inflamed state of its natural textures. Even a mere puncture of the eye is often sufficient to produce collapse under such circumstances. In the medullary tumour these proceedings are of no avail; but, as Mr. Travers advises, if any doubt of the nature of the case exist, a section of the eye should be practised. In the malignant disease the globe remains firm, the section being followed only by a small discharge of blood; but if a considerable discharge of discoloured fluid or matter takes place, and the globe collapses, the disease is not malignant, and the cure is complete.

Treatment.—Encephaloid tumour, like scirrhus, has hitherto resisted the power of all external and internal medicines.[18] It is proper to try the effect of an improved diet, change of air, and other influences likely to maintain the general health. That they retard the advance of the disease, is well shown by the cases recorded by Mr. Tyrrell.[19]

Extirpation of the eye has frequently been performed on account of this disease; but there seems to be no sufficient evidence that it has ever effected a radical cure.[20] In most cases, the disease has certainly been known to return after extirpation of the eye; the optic nerve having probably been diseased previously to the operation, or, at all events, giving rise afterwards to a new growth, sufficient to fill the orbit in the course of a few months, or even weeks; so that although the removal of the eye may have saved the patient from the suffering which always attends the rupture and destruction of that organ, yet it probably hastens rather than retards the fatal termination of the disease. In children, the extirpation of the eye has always failed when the disease was so far advanced that the vitreous chamber was filled by the fungous mass; whether it might be more successful were it performed when the disease first appears at the bottom of the eye, it is impossible to say. At that early period the relatives of the patient could scarcely be expected to bring themselves to consent to extirpation of the eye; nor, after the statements of Mr. Lawrence and Mr. Travers, regarding the uncertainty of the diagnosis, could the surgeon fairly insist on this measure, as being absolutely indicated.

After the eye has burst, and a large, heavy, pendulous mass protrudes, this may be cut off, as a palliative measure.

During the inflammatory attacks which attend the progress of encephaloid tumour within the eye, or in the orbit after the eye has been extirpated, advantage will be derived from the application of leeches to the temple, a mild diet, laxatives, and evaporating lotions. If bleeding occurs, as the parts will not bear pressure, we must trust to the application of cold water, alum solution, and the like. In the advanced stages of the disease, opiates will be required internally; and their external application also gives relief.

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[1] Dissertations on Inflammation; Vol. ii. p. 302; Glasgow, 1800.

[2] Practical Observations in Surgery; p. 233; London, 1803.

[3] Abernethy's Surgical Observations, containing a Classification of Tumours, &c.; p. 51; London, 1804.

[4] "Puerulo trienni aperui caput. Hic aliquot mensibus ingenti laborabat tumore ex oculo sinistro, adeo quidem ut integer bulbus ocularis cum musculis omnibus foras protuberaret, in tantamque accrevisset molem ut duos pugnos protuberantia æquaret. Huic duabus ante mortem septimanis alius tumor ortus fuerat prope musculum temporalem sinistrum, quem, ablata cute, vidimus peculiari (eaque crassa satis) membrana obductum intra cutem, craniumque hærere. Cranium exiguum habebat foraminulum, per quod materiam ejecerat natura. Ablato cranio, vidimus ocularis tumoris materiam intra cranium et duram matrem collectam universam integro planè et illæso cerebro. Aperto utroque tumore, vidimus eos substantia cerebro planè simili repletos, permixto sanguine concreto, haud aliter ac si molæ substantiam vidisses." Petri Pawii Observationes Anatomicæ; p. 38; Hafniæ, 1656.

Nicolaus Larcheus, in a letter to Marcus Aurelius Severinus, has described and figured a fatal case of what appears to have been fungus hæmatodes, in a child of five years of age. He describes the tumour as originating under the eye. See Severinus de recondita Abscessuum Natura, p. 150; Francofurti ad Mœnum, 1643.

[5] Case of Diseased Eye, by Mr. Hayes; read August 26th, 1765; Medical Observations and Inquiries; Vol. iii. p. 120; London, 1767: Descriptive Catalogue of the Pathological Specimens in the Museum of the Royal College of Surgeons of England; Vol. iv. p. 167; London, 1849.

[6] Chirurgical Observations relative to the Epiphora, &c.; p. 49; London, 1800.

[7] Op. cit. p. 283.

[8] Observations on Fungus Hæmatodes; p. 6; Edinburgh, 1809.

[9] Carron du Villards has the candour to confess his having fallen into this error; Journal Complémentaire des Sciences Médicales; Tome xliv. page 6; Paris, 1832.

[10] Medico-Chirurgical Transactions; Vol. xxiii. p. 209; London, 1840.

[11] See Case of Extirpation of the Eyeball, by J. H. Wishart; Edinburgh Medical and Surgical Journal; Vol. xl. p. 274; Edinburgh, 1833: Panizza (Sul Fongo Midollare del Occhio, p. 16. pl. iii. fig. 1; Pavia, 1821.) found, on dissection, in a girl of six years of age, a small tumour surrounding the left optic nerve, within the orbit, the nerve itself being sound, the right nerve fungous, and a large cerebriform mass in the basis of the brain.

[12] See Case by Bowman, with dissection of eye; Medical Times and Gazette, January 29, 1853, p. 116: Descriptive Catalogue of

the Pathological Specimens in the Museum, &c., loc. cit.

[13] See Case of Fungus Hæmatodes of the Eye and Brain, with Dissection of the Brain, by Lightfoot; Medical Times and Gazette, September 4, 1852, p. 247.

[14] On the microscopic characters of encephaloid tumour, see Paget's Lectures on Surgical Pathology; Vol. ii. p. 367; London, 1853.

[15] On the Nature, &c. of Amaurosis; p. 37; London, 1821.

[16] Op. cit.

[17] See Case by Dr. R. Hibbert Taylor; London Medical Gazette, July 4, 1845, p. 425.

[18] Professor Rosas writes me, that he has found mercury useful in arresting the progress of medullary tumour of the eye.

[19] Practical Work on the Diseases of the Eye; Vol. ii. p. 165; London, 1840.

[20] On the propriety of extirpation, see Syme, Edinburgh Medical and Surgical Journal; Vol. xliv. p. 6; Edinburgh, 1835. He is against operating. "In no case of genuine medullary fungus of the eye," says Dalrymple, "would I either perform, or sanction by my advice, the extirpation of the eyeball." Pathology of the Human Eye, explanation of Plate xxxiii. London, 1852.

SECTION III.—MELANOSIS OF THE EYEBALL.

From μέλας, *black*.

Fig. Travers, Pl. IV. *figs.* 3—6. Ammon, Thl. I. Taf. XXIII. Dalrymple, Pl. XXXIV. *figs.* 4, 5.

To this morbid growth Laennec gave the name of *melanosis*, on account of its black colour.[1] Equivocal traces of an acquaintance with it are to be found in the works of Bonetus, Haller, Morgagni, and others; but the Continental pathologists of our own times have been the first to treat of melanosis as a distinct and peculiar affection. In the beginning of the present century, Bayle and Laennec first published upon the subject; but it would appear from a controversy which arose on that occasion, that M. Dupuytren had been acquainted with the disease several years before, and had annually mentioned it in his lectures.[2] Since this period, melanosis has attracted the attention of numerous pathologists, both on the Continent and in this country; of whom we may mention particularly M. Breschet, who has inserted a paper on the subject in the first volume of Magendie's Journal; and Mr. Fawdington, who has given to the public an interesting case, with observations on the pathology of the disease, and eight lithographic plates, illustrative of its appearances in various organs of the body.

The most striking physical character of melanosis, in whatever region of the body or under whatever form it occurs, is its dark colour, varying from the hue of Indian ink to a light bistre, and depending on the presence of pigment granules or nuclei, similar to those of the pigmentum nigrum. In consistence, the product of melanosis often bears a considerable resemblance to that which the contents of a decaying lycoperdon, or common puff-ball, would present if rendered cohesive by the addition of a small quantity of liquid. Melanosis displaces or destroys the different textures of the body in a variety of ways. It is most frequently met with in tubercles, or even in considerable masses; is sometimes encysted and connected to the neighbouring parts by pedicles; sometimes diffused through the parenchyma of the viscera; in other cases, deposited upon their surface, or under their investing membrane. It appears that no tissue is free from the invasion of this disease, although it attacks some parts more readily than others. Like fungus hæmatodes, it attacks several organs of the body together, or in succession: the eye, for example, and the liver. In its progress it involves indiscriminately the adjacent textures, supplanting and destroying all that oppose a barrier to its ravages. Even the bones are not exempt from its influence.

M. Breschet was at some pains to ascertain whether the substance of melanosis was truly organised. With this view, he threw into the arteries and veins of the contiguous parts some of the finest and most diffusible injections, without discovering any continuity of vessels between the cyst and the substance it contained. The cells, of course, which compose this substance, must have their periods of growth, maturity, and decline.

Dr. Rainy, on examining some melanotic substance taken from an eye which he had extirpated, along with the eyelids, observed that a granular matter escaped when the melanotic substance was torn under the microscope, while the solid part presented the appearance of contorted hollow fibres, not unlike some kinds of moss, or the villi of the chorion. These fibres were quite different in their aspect from blood-vessels, and seemed filled with granules, not globules. Next day, Dr. Rainy examined a portion of another eye, which had been extirpated 18 months before, and found the same sort of fibres.[3]

The composition of the tumours in melanosis has been ascertained, by chemical analysis, to approach very nearly to that of the coagulum of the blood. Thenard and Barruel recognised a large quantity of carbon in melanosis, and to this some have attributed the black colour; but erroneously, for the blackness of melanosis is discharged by the action of chlorine.

Melanosis is undoubtedly of a fungous nature, and being not unfrequently found in conjunction with other kinds of fungous disease, especially the medullary, it has been regarded by Mr. Wardrop[4] and others, merely as a variety of fungus hæmatodes. This view is, no doubt, countenanced by the fact that tumours have been met with, possessing almost every possible degree of intermediate feature, so as to render it difficult to determine whether the character of melanosis or that of medullary fungus prevailed. If, however, we take the extreme states of each disease, we discover, as Mr. Fawdington observes, differences of a very marked and striking character. In the anatomical structure of melanosis, the paucity of vessels constitutes a distinguishing peculiarity; while medullary tumour, which invades the system as extensively, appears under similar forms, attacks the same textures, and eventually produces a like influence on the general economy, is remarkable for a luxuriant vascularity. Laennec remarked that fungus hæmatodes is in general supplied by a great many blood-vessels, the trunks of which ramify on the exterior of the tumours, or between their lobes only, while the minuter branches penetrate into the substance of the morbid growth; and that the coats of these vessels being very fine, they are readily ruptured, thus giving rise to clots of extravasated blood in the interior of the tumours, sometimes of considerable size. Nothing of this kind is observable in melanosis; no extraordinary development of arterial branches leading to the tumours, none visibly ramifying on the cysts which surround them, none in the morbid substance.

Mr. Fawdington has carefully compared the local phenomena presented during life by these two diseases. In fungus hæmatodes, if the tumour be at all advanced, there is pain, constant or occasional, sharp and lancinating, and often accompanied by signs of low vascular excitement. As the disease proceeds, the suffering is increased; an ulcerated breach having been produced in the integuments, the fungus grows and sloughs by turns; it discharges an offensive sanies, and considerable bleeding takes place, which for a time relieves both the vascular and nervous irritation attendant on the progress of the disease. Lastly, the absorbent glands in the vicinity participate in the mischief, and the general powers become exhausted, from the combined influence of pain, irritation, and discharge. In melanosis, unless the growth of the tumour be circumscribed by textures which yield with difficulty, such as the tunics of the eyeball, or the cavity of the orbit, there is neither pain, as a necessary concomitant, nor an excited state of vessels in the circumjacent structures. As to the phenomena of melanosis in the ulcerative stage, there seems to be a blank still left to future observers to fill up; but reasoning from its low state of organisation, it may be concluded that many of the pathological changes which attend the career of fungus hæmatodes will not be found to exist in melanosis. The process upon which the softening of this tumour depends, is as inexplicable as the laws of its production and increase, but that it arises from a power inherent in the morbid structure, and distinct from the common conditions of suppurative inflammation in other structures, is to be inferred from the absence of those agents which support the latter, in the situation where the softening is first observed.

Symptoms of melanosis of the eyeball.—When the disease is seated within the eyeball, the patient, in the early stage, complains of imperfect or destroyed vision, with a sense of fulness and pain in and around the eye, followed by a peculiar opaque appearance of the pupil and attenuation of the sclerotica, so that a mass of brown or black substance appears shining through it. The swelling and pain come and go for a time. Sometimes the pain, in the early stage, is, along with loss of sight, the most prominent symptom. In a case of this sort, the pain was so insufferable, that M. Gensoul extirpated the eye on this account alone; and found within it a melanotic tumour, which had not extended beyond the retina.[5] The eyeball is rarely much enlarged. The cornea or sclerotica gives way, and a black fungus protrudes, which increases slowly, and in general does not bleed much. In one case only have I seen much hæmorrhage from an eye affected with melanosis. The patient, a middle-aged female, came to the Glasgow Eye Infirmary with a dark fungus protruding through the ruptured cornea: it had bled so profusely that she was completely blanched. I immediately extirpated the eye, and found the melanotic tumour to spring from the end of the optic nerve, exactly as encephaloid tumour does in the majority of cases.

Melanosis attacks eyes which are already disorganised by other diseases; eyes which are shrunk, or staphylomatous; which is not the case with fungus hæmatodes. Sometimes melanosis looks like a staphyloma, and has been operated on as such. On making his incision, the surgeon finds the eye solid, being filled with melanotic deposit.

If the tumour which protrudes from the eye be cut off, the part heals, and by and by the melanosis protrudes afresh. This I have witnessed in several instances.

In one of the cases in which Dr. Rainy extirpated the eyeball, at the Glasgow Eye Infirmary, the optic nerve was affected with the melanotic degeneration, but not all the way back to the optic foramen.

Between the choroid and the retina is the most frequent seat of melanosis; but, like fungus hæmatodes, it occasionally occurs exterior to the eyeball, in the eyelids, under the conjunctiva, on the surface of the cornea (p. 253), at the junction of the cornea and sclerotica, and in the cellular membrane of the orbit (p. 333). In the last-mentioned situation, the tumour pushes the eye before it, and at last the eye is destroyed by inflammation.

Cases.— In Mr. Wardrop's work on Fungus Hæmatodes, and again in Mr. Allan Burns' Observations on the Surgical Anatomy of the Head and Neck, the following well-marked case of melanosis of the eye is related, merely as a variety of medullary tumour.

Case 645. — Mrs. Scott, about 41 years of age, had always been of a delicate habit of body, and sallow complexion. The disease of the eye occupied a period of two years and a half. It first manifested itself, by the patient being unable to see distinctly with her left eye; and on looking at the organ, a milkiness was seen behind the pupil. This opacity, which Mr. Burns speaks of as seated in the lens, gradually increased during four months, when the patient became completely blind of that eye. About four months after losing the sight of the eye, it became much inflamed, without any obvious cause. By bleeding with leeches, &c. the inflammation abated, but the redness and pain never entirely left the eye. From what Mr. B. had been able to learn, the opacity of the lens could not be so decidedly ascertained after this attack, owing to the turbid state of the contents of the anterior chamber.

The further progress of the case was not traced till within six months of the time when Mr. B. thought it necessary to remove the contents of the orbit by operation. At the beginning of that period, a tumour began to protrude from the lower side of the sclerotic coat, just behind the edge of the cornea. Two months after this, Mr. B. found the cornea rather more prominent than usual, but he could distinguish with accuracy neither the iris nor the crystalline. The appearance impressed him with the idea, that a fungus was lodged behind the cornea, ready to protrude as soon as the latter should give way. The tumour at the lower part of the sclerotica was now about the size of a musket-ball, and seemed to contain a dark-coloured fluid, the cyst being formed by that part of the conjunctiva which covers the sclerotica, while over the surface of the sac a number of red vessels ran in every direction. The pain was intense and lancinating.

After four months more, matters were in a much worse state, and the patient's health completely broken; she had confirmed hectic fever, was much reduced, and had not been out of bed for two months. The cyst, which formerly had not been larger than a musket-ball, had now attained the size of a pigeon's egg, and formed a solid fungous mass, which could with difficulty be raised, so as to uncover the lower eyelid. The cornea was flat, and was hid beneath the upper eyelid. From the body of the large fungus, two small fungi protruded, and towards the temporal extremity of the lower eyelid, there was a hard tumour, situated under the integuments and adhering firmly to the cheek-bone.

The patient was anxious to have the parts removed by operation, which was accordingly done by Mr. Burns, assisted by Mr. Wardrop. As the tumour exterior to the eyelids was of considerable size, Mr. B. separated them by an incision at their temporal angle. He then grasped the tumour, and dissected back the eyelids from it. As he wished to take out all the diseased parts in connection, he endeavoured to detach them from the lower margin of the orbit; but, to his surprise and regret, he found that the bone on which they rested was softened and black in colour. He therefore gave up the attempt, and proceeded with the scalpel to detach the eyeball from its connections. By the pressure employed in pulling forward the parts, they burst, and a quantity of inky fluid was poured from the opening. Mr. B. traced the optic nerve to its exit from the skull, and there divided it. Its medullary substance was as black as ink. He next chiselled away as much as he could of the diseased edge of the orbit. The bleeding from the divided vessels was easily restrained.

As soon as possible after the operation, a section was made of the parts which had been removed. When dividing the eyeball and optic nerve, a great quantity of a thick, viscid, dark-brown matter, coloured the knife. The eyeball and tumour seemed entirely composed of a similar dark-coloured matter, of the consistence of thick oil-paint, though not so clammy and oleaginous. It soiled the fingers of a dark brown or amber colour. It readily dissolved in water, and both Mr. Burns and Mr. Wardrop were struck with its resemblance to the pigmentum nigrum. The cornea appeared sound. The crystalline lens was of an amber colour. The sclerotica, at that part which corresponded to the malar portion of the orbit, was ruptured by the tumour, and the torn edges were separated about a quarter of an inch from one another. The sclerotica was at the same place split into two layers, a small quantity of the dark-coloured substance being interposed between them. No distinct remains could be traced of the iris; but the choroid appeared much more vascular than natural, and at one part was five or six times its usual thickness. At the place where the sclerotica was ruptured, the choroid insensibly terminated in a white pulpy substance, composing part of the diseased mass. The contents of the eyeball were composed chiefly of a medullary substance, tinged in different places by the dark-brown colouring matter. The tumour projecting beyond the sclerotic coat, appeared to be composed of a similar structure, and upon maceration, numerous white striæ, and in some places spots, appeared throughout the substance of the diseased mass. Exterior to the eyeball, the tumour was covered with a thick mucous membrane, except at the two small prominent parts where it had ulcerated, this covering being probably derived from the conjunctiva, which the tumour in its progress had pushed before it.

The optic nerve was of its natural size; but on examining its section, it was found that the medullary part of it had a black appearance, exactly resembling the tumour in the eyeball, while its neurilemma was apparently healthy. No remains of the retina could be detected. One of the lymphatic glands lying by the side of the optic nerve, was changed into a dark-coloured substance.

Although much reduced by hectic, and emaciated to a great degree, the patient soon gained flesh and strength, her appetite was restored, she slept well, and was able to walk about. The orbit discharged good pus in moderate quantity, and was at last filled up with a soft substance, which, although dark in colour, skinned over.

When recovery seemed certain, the weather became cold and damp; the patient lost her appetite, and became unable to walk from pains in the loins. She could obtain no sleep, except from opium. The lower eyelid was protruded by an elastic fungus, which also began to project from between the lids. The disease in the orbit gave her no uneasiness, her whole complaint being seated in the back and loins. The pain there was excruciating. She could neither turn in bed, nor permit herself to be turned. In this condition, she lingered for two or three months; the tumour below the orbit all the while increasing in size, and the pain in the loins in no degree remitting. When Mr. B. saw her, three weeks before her death, she was emaciated to the last degree. The tumour below the orbit was as large as a pullet's egg; its surface unequal, the most prominent parts of it covered with livid integuments, and the swelling conveying to the fingers the impression as if it contained a fluid. From between the eyelids, a very small fungus protruded, covered with bloody-looking matter. She had little or no pain in either the orbit or the head, and the vision of the other eye remained unimpaired. From this time to her death, she sunk gradually, the tumour going on to enlarge, and becoming more discoloured on its surface, and more irregular, but the fungus between the lids undergoing no change. About twenty-four hours previous to her death, she became suddenly comatose.

On dissection, the liver was found to contain tumours of a similar texture and appearance with the contents of the eyeball, as ascertained after its extirpation.

There was also a cyst in the substance of the liver, filled with a great quantity of grumous-looking purulent matter. Above the kidneys there were similar tumours of pretty considerable size, and the uterus was cartilaginous. The urinary bladder was enormously distended with a turbid bloody-looking fluid; but otherwise, in so far as this viscus was examined, its structure appeared healthy.

By making a vertical section of the orbit and fungus it contained, the tumour was found to arise entirely from the antrum, which had burst both above and in front. The fungus projected also beyond the lower spongy bone and investing membrane of the nose, into the nostril. The tumour proceeding from the antrum, studded over on its outer surface with small knobs of a dark livid colour, was internally made up of a soft substance of an ink colour, intersected by membranous slips, and intermixed with a grayish substance, and with ragged fragments of bone. The anterior wall of the antrum was destroyed at its upper part, and the floor of the orbit was elevated, so as to have merely the periosteum and a thin layer of fat between it and the orbitary plate of the frontal bone. The fungus was exterior to the orbit, although from the destruction of the periosteum attached to the malar portion of the orbit, it had been allowed to protrude from between the eyelids. This portion of the periosteum was destroyed partly by disease, and partly in consequence of the removal of a carious portion of the bone, when the eye was extirpated.

With regard to the optic nerve, it was expected that its extremity would have been connected with the fungus. Between them, however, the periosteum of the floor of the orbit was interposed. The nerve itself was of its natural size, but of a black colour where it entered the foramen opticum. From this point to near where it had been divided in the extirpation of the eyeball, it was in a similar state; the neurilemma had only a slight connection with the diseased substance of the nerve. At the bottom of the orbit there was considerable matting and induration of the origin of the muscles. At its termination, the nerve formed a sharp point, its coats adhered to the thickened periosteum of the floor of the orbit, which was pressed into contact with it by the fungus from the antrum. The optic nerve within the cranium was as thick as the little finger, and as dark in colour as the part contained in the orbit. The junction of the nerves was so much enlarged, that it formed a tumour extending into the third ventricle. The dark colour was found to extend much beyond the point where the nerves join; but this change of colour was confined to the left side, or to the nerve of the affected eye. On the right side, the nerve was of its natural size and colour, and was attached to the black diseased parts merely by cellular shreds.

Case 646. — In January, 1824, Thomas Peckett, aged 30, a robust healthy-looking man, consulted Mr. Wilson of Manchester, respecting a violent and incessant pain in his left eye. Six months previously, he had received a blow upon the organ, from a small piece of iron; but the injury appeared trifling, as he experienced but little pain, and the eye did not exhibit any external appearance to attract notice. About a fortnight after the accident, he experienced a sensation of fulness in the globe, and upon shutting his right eye, discovered that his sight in the left was very imperfect. The pain and dimness gradually increased, the former to a most distressing degree, affecting chiefly the ball of the eye and margin of the orbit.

The conjunctival vessels were now enlarged and tortuous, and the sclerotica generally inflamed and undergoing absorption, the dark choroid being visible towards the internal canthus. The iris was immovable, and a slate-coloured opacity occupied the centre of the dilated pupil. No symptoms of cerebral affection were manifested. The treatment had been limited to the occasional application of leeches to the temple.

By drawing blood freely and repeatedly from the temple and nape of the neck, together with blistering, active cathartics, and an abstemious diet, the pain was removed; but no amendment in vision ensued. After remaining in Manchester nearly a month, he was permitted to return into Staffordshire.

Towards the end of March, he applied on account of a return of pain. A few days after he returned home, he had experienced his former sensations, and the pain was now so violent and incessant, as to prevent him from sleeping. The sclerotica, at its upper part, and towards the inner canthus, was extremely attenuated; the choroid covering the protruding substance. The opaque appearance in the pupil had assumed a dirty-red colour, resembling newly organized lymph, and this seemed to be the apex of a conical-shaped body, situated deep in the eye.

The former treatment, with moderate ptyalism, was ineffectually adopted, and on the 19th of April, Mr. Wilson removed the contents of the orbit.

A section of the eyeball discovered, in the situation of the vitreous humour, a black pultaceous tumour, occupying more than one-half of the interior of the globe. There were two cavities or cells filled with a brownish-red fluid, one situated at the side of the tumour, the other anterior to it, and behind the lens. No trace of the vitreous body could be discovered. The choroid was entire, and could easily be separated from the sclerotica, except at one point towards its superior and internal part, where it ceased to be distinguishable from the general mass of the tumour. The sclerotica was here reduced to an extreme degree of tenuity, and had a split appearance. The retina was quite detached from the choroid by the interposition of the disease, and lay folded across the globe, forming a kind of septum between the black mass and the larger of the two cavities, containing the brownish-red fluid. The lens was opaque, and the capsule thickened, but partially transparent; a fold of retina covered the posterior capsule. The ciliary ligament was distinct, and some ragged portions of membrane at the margin of the lens, and posterior to the iris, which was perfect, showed a remnant of the ciliary processes. The optic nerve, where it had been divided at the time of the operation, appeared to be sound.

He recovered from the operation, and returned home at the end of a month, apparently well.

In August he again applied, on account of three or four tumours on the face, about the size of leaden shot, perfectly black, but unattended by uneasiness. He complained of difficulty of breathing, and stitches in his side, with a short cough. He had evidently wasted in flesh, and his pulse was quick and remarkably sharp. A tumour similar to those on the face, was discovered on the skin of the back, between the scapulæ. In a few days, one or more were found on the scalp.

His strength rapidly declining, he came under the care of Mr. Fawdington, on the 2nd October. His general aspect indicated a deficient supply of nutriment, or an imperfect appropriation of it to the purposes of the system. The surface of his body was pale and exsanguineous, and there was a considerable degree of muscular emaciation, with œdema of the legs. But the most striking feature of the case was an exceedingly protuberant abdomen, apparently from enlargement of one of its viscera, and this probably the liver. The face and scalp displayed several perfectly developed melanotic tubercles, and one on the lower lid of the extirpated eye appeared on the verge of ulceration. The bottom of the orbit was free from any visible melanotic deposition. In every other situation, excepting two or three points on the trunk, the cutis had escaped the direct invasion of the disease; but the subcutaneous tissue, over the whole chest and abdomen, was evidently loaded with melanosis, giving rise, where the cysts encroached on the skin, to faint-blue elevations, more or less distinct, and of various sizes; none, however, exceeding the fourth of an inch in diameter. The patient died on the 3rd November. On dissection, the subcutaneous cellular texture on the front of the trunk was found granulated with melanotic tubercles. The liver, enlarged to four times its natural size, was disorganised by the same disease; with which also the peritoneum, pancreas, spleen, kidneys, pleuræ, lungs, and heart, were more or less affected. The brain was not examined.[6]

Case 647.—John Taylor, aged 41, of a dark unhealthy complexion, was admitted at the Glasgow Eye Infirmary, on the 13th May, 1834. About nine years before, while in America, the vision of his left eye became dim, and was soon entirely lost. The bulb of the eye, on his admission, was shrunk and knobbed. There were still some traces of cornea, behind which was a white substance, apparently the lens. Adhering to the bulb of the eye, at its nasal margin, there was a prominent tumour larger than a pea, smooth on the surface, covered by the conjunctiva, and firmly attached to the bulb. Pressure on the tumour occasioned pain. The patient also complained of uneasy feelings in the forehead, especially above the left eyebrow. The left lower eyelid was inverted, and the consequent friction of the eyelashes seemed to excite irritation in the tumour. The right eye was sound.

On the 19th, the inversion of the eyelid having been already cured by operation, a portion of the tumour was removed with the scissors. Its contents were dark-coloured, and of considerable consistence, so that the tumour did not collapse.

On the 23rd, a grayish fungus protruded in the situation of the tumour. The patient was advised to have the eye extirpated; but unwilling to submit to the operation, he discontinued his attendance.

He returned on the 5th August, and signified his wish to have the eye removed. The dark-coloured soft tumour, occupying the nasal half of the left eye, had now attained the size of a large filbert, and was rapidly increasing. Its anterior surface was marked with a stellated scar, the result of the former operation. (Fig. 73.) The patient complained of considerable pain of the left side of his head, down to his neck, preventing sleep. His stomach was very irritable.

On the 7th, I extirpated the eye, after which the lids were covered with a piece of simple dressing and a roller.

On examination, the whole eye was found atrophic. The cornea, as could be seen before the operation, was not more than two lines in diameter; it was transparent, so that the opaque lens could be seen through it. The optic nerve was much reduced in thickness, indeed nothing but the neurilema of the fibrils seemed to be left, all the medullary matter being absorbed. The tumour, which was about five or six lines in diameter, protruded through an opening in the sclerotica, on the nasal side of the dwarfish cornea. It was covered externally by a production of the conjunctiva.

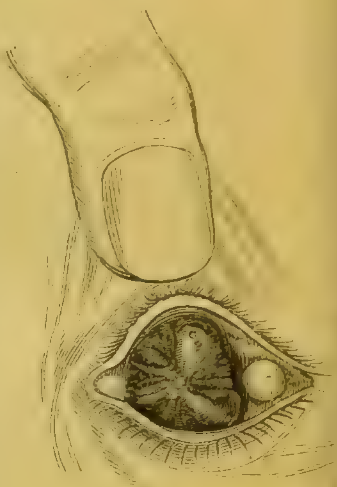
Fig. 72.

On making a section of the tumour, it was found to consist of a light bistre-coloured tissue, nearly of the consistence of muscle, which, when torn, indicated a fibrous structure. The section through the tumour having been continued through the eyeball, the latter was found to have undergone extensive disorganisation. There were some remains of the choroid and annulus albidus; but a bony lamina occupied the place of the retina; and the neurilemma, which was all that remained of the optic nerve, at the place where this joins with the retina, had several earthy deposits in it. The lens was entirely converted into an earthy matter, which affected a laminar arrangement. The capsule was very tough. There was no trace of iris nor posterior chamber. The anterior chamber was very small. All the rest of the interior of the eye was filled by a melanotic mass, of a pappy consistence, from which the tumour appeared to rise. There was, moreover, towards the inner side and back part of the eye, a small mass of a reddish-white matter like brain, and, close by this, a small quantity of a soft dark-red matter. In the interior of the tumour, some dark-red matter was also observed surrounding and isolating a nodule of the bistre-coloured substance from the rest of the mass.

The pappy melanotic matter contained in the interior of the eye, being examined with the microscope, was observed to be composed of black particles of no definite form, interspersed among which were some minute crystals of a rhomboidal shape. The tissue composing the tumour, which, as has been said, was somewhat fibrous, on examination with the microscope, was seen to consist of flattened globules, considerably larger than those of the blood, united together in fibres by a delicate cellular tissue. The most of the globules were light coloured; but there were interspersed among them a number of dark-coloured bodies, which appeared to be globules, containing in their substance black particles. The brain-like and dark-red matters were also composed of globules, but very few black bodies were observed among them.

The patient experienced no uneasiness after the operation, and felt quite relieved of the pain which he complained of before the removal of the eye.

Case 648.—In July, 1835, Mr. Espie, surgeon at Falkirk, was called to visit James Campbell, aged 40, a labourer in the parish of Larbert. When 10 years of age, the patient lost the use of the left eye from traumatic cataract. Fourteen years before Mr. Espie's visit, a swelling formed at the left angle of the lower jaw, suppurated, and burst internally. This suppuration left a pain in and round the right orbit, with dimness of sight in the right eye. These symptoms increased, and after two years the patient consulted the late Dr. Monteath, of Glasgow, who considered the vision of the right eye all but gone, and advised no remedy for it, but recommended the removal of the left lens. The patient went to Edinburgh, and repeatedly submitted to the operation of couching, the lens having several times re-ascended. At length, extraction was practised; but the eye inflamed violently, the cornea became opaque, and all hope of restoring the sight was lost. The friends of the patient, about this time, observed the right sclerotica becoming black, and the eyeball enlarged.

Mr. Espie found the right eyeball much enlarged, burst, and sending forth a black fungus, which, in several places, had given way, and was discharging considerable quantities of melanotic matter. There appeared to be much determination of blood to the right orbit. The general health was impaired, and the bowels irregular. Mr. Espie ordered repeated leeching around the orbit, and a blister behind the ear. The patient found great relief from the local bleeding, and his general health improved under the use of a nourishing diet, and occasional doses of laxative medicine.

Mr. Espie saw nothing more of the patient till September, 1836, when, being again called to visit him, he found the eyeball still larger than before, with blood oozing from it, and melanotic matter continuing to be occasionally discharged from it. The patient complained of pain in the right side of his head, and darting from the orbit to the hind-head. His general health was again somewhat impaired. The same advice was given as before, and was followed by a similar improvement.

The fungus continuing to enlarge, and the discharges from it to increase, particularly the bleeding, in January, 1837, Mr. Espie sent the patient to me for advice.

At this period, the tumour, which hung from the eye through the destroyed cornea, was of the size and shape of a large French plum flattened; it was no longer within the cover of the eyelids, but lay upon the cheek, and wagged about as the patient moved his eye. It was slightly lobulated, and quite black. Its investing membrane appeared as if abraded, and occasionally gave way and bled. It had a most offensive smell. The patient still complained of pain, and of a feeling of traction in the course of the optic nerve. I had no hesitation in recommending extirpation of the eye, with as much as possible of the optic nerve.

The patient having been seized with influenza, the operation was postponed till the 20th February, when it was performed by Mr. Espie.

On examining the parts which were removed, the sclerotica appeared entire, but greatly atrophied, the natural contents of the eyeball completely destroyed, a pretty thick cup-like deposit of bone within the sclerotica at the back part of the eye, the rest of the cavity filled with the melanotic tumour. At one period the optic nerve, on its way to the retina, had passed through a small hole, which was found in the ossific deposit. On making a section of the tumour, it appeared divided by septa. The melanotic matter had an oleaginous appearance, and, with some shades of dark brown was of a deep black colour. The optic nerve was reduced to about one half of its ordinary thickness; it was somewhat softened, but not black.

In 10 days, the patient had perfectly recovered from the operation, and acknowledged that he had not enjoyed such good health for 12 years.

He continued to enjoy excellent health, locally and generally, up to March, 1850; when, stooping rashly, the right orbit sustained a severe blow from a cow's horn. Smart antiphlogistic treatment was necessary to prevent the extension of the orbital inflammation into the brain; but after about four weeks, the pain had gone, and the swelling nearly so.

Mr. Espie heard nothing more of the case until March, 1852; when he learned that, while forcibly pulling at a rope attached to a cow, the patient felt something give way suddenly in the right orbit, so that he called aloud—"My eye is out!" When Mr. E. saw him next day, the right orbit was greatly swelled, somewhat discoloured, very painful, and felt like to burst. There was obscure fluctuation. Mr. E. found it necessary, at the end of two days, to relieve the extreme tension, by an incision under the upper eyelid, which gave exit to a large table-spoonful of melanotic matter. Poultices and anodynes were had recourse to; and, in four days, the swelling having increased, burst through the upper and inner part of the upper eyelid. Through the opening thus formed, melanotic matter was freely discharged for four or five weeks, when it subsided, along with the general orbital swelling.

The condition of the orbit had never been quite satisfactory since the injury received in 1850; the swelling never having completely subsided.

In March, 1854, the patient was in good health; suffering only from sciatica.

Causes and treatment. — As to the remote and exciting causes of melanosis, we are quite in the dark; nor can we say anything with certainty on the method of cure.

Does extirpation afford any greater hope of permanent benefit, than in cases of fungus hæmatodes? Mr. Lawrence[7] thinks it does. "In the early stage of melanosis," says he, "when you can be confident that it has not extended beyond the original seat in the eye, there seems to be a chance of permanent cure by removing the disease." He refers to the case of an Irishman, about 30, from whom he removed an eye affected with melanosis. Between one and two years after the operation, he was perfectly well. In another case, where the disease had existed longer, the patient died ten or twelve days after the operation, and on dissection, the liver was found enormously enlarged, and filled throughout with melanotic depositions.[8] The experience of the profession generally, within the last twenty years, shows that melanosis, although slower in its progress, is scarcely less liable than encephaloid tumour, to affect the brain and other internal organs, and thus to prove fatal.

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[1] Some of the lower animals, and especially the horse, are subject to black tumours, which are said not to partake of a cancerous or malignant character.

[2] Journal de Médecine de Corvisart; Tomes ix. et x.

[3] On the microscopical characters of melanosis, see Paget's Lectures on Surgical Pathology; Vol. ii. p. 484; London, 1853.

[4] Observations on Diseased Structures, prefixed to the second volume of Baillie's Works, p. liii.; London, 1825.

[5] Annales d'Oculistique; Tome vii. p. 31; Bruxelles, 1842.

[6] Case of Melanosis, by Thomas Fawdington; London, 1826.

[7] Lectures on Surgery, London Medical Gazette, Vol. vi. p. 39; London, 1830.

[8] For cases of melanosis of the eye, see Transactions of the Medico-Chirurgical Society of Edinburgh, Vol. i. pp. 272, 274; Edinburgh, 1824: Gräfe und Walther's Journal der Chirurgie und Augenheilkunde, Vol. xii. p. 662; Berlin, 1828: Liston, Medical Gazette, Vol. vi. p. 224; London, 1830: Pruscha de Melanosi Bulbi Oculi, pp. 33, 37; Viennæ, 1831: Byron, Dublin Medical Press, April 20, 1842, p. 247: Robertson, Northern Journal of Medicine, November, 1844: Windsor, Provincial Medical and Surgical Journal, May 1, 1850: Lawrence, Lancet, August 1, 1846, p. 122: Critchett, Ib., October 25, 1851, p. 386: Hancock, Ib., December 25, 1852, p. 587: Bowman, Medical Times and Gazette, May 21, 1853, p. 525.

CHAPTER XVIII.

EXTIRPATION OF THE EYEBALL.

1. When we are about to extirpate the eyeball, it is better to lay the patient on his back, with his head raised on a pillow, than to keep him in a sitting position. He ought then to be brought fully under the influence of chloroform.

2. When the eyeball is not enlarged, the fissure of the lids wide, and the eye the only part to be removed, the extirpation may be accomplished without disuniting the lids at their temporal angle. But if, on the contrary, there is considerable enlargement of the eyeball, or if the muscles of the eye, or the whole contents of the orbit, are to be dissected out, it is necessary first to disunite the

lids, by means of an incision carried outwards from their external angle, towards the temple, else the lids will probably be cut and disfigured in accomplishing the extirpation. Even when the eye is small, such disunion of the lids enables us to accomplish the operation with much greater facility. Nor ought it to leave any additional deformity; for the edges of the incision, being brought together when the operation is finished, generally adhere by the first intention. Care must be taken in making this separation of the lids, not to limit the incision to the skin, but to go through the fibrous layer and the conjunctiva, so that the eyeball may be fully exposed.

3. The operator now passes a large curved needle, armed with a thick waxed thread, through the eyeball, from its temporal to its nasal side, avoiding any part which appears to be so disorganised that it would give way under traction by the ligature. The needle is then cut away, and the ends of the double thread knotted together. By means of the thread, the eye can be carried in any particular direction during the remaining steps of the operation. Some prefer a large sharp hook for the same purpose; others, a double volsella.

4. When the disease is entirely confined within the eyeball, and this not much enlarged, and freely moveable, the eye may be extirpated, as was pointed out by O'Ferrall[1] and Bonnet[2], and has been practised by Stöber[3], Critchett[4], and others, simply by laying open the ocular capsule (p. 294) in front. The lids being held apart, the surgeon takes hold of the conjunctiva at the inner canthus with forceps, and cuts it through with scissors, as if he were about to operate for strabismus. He divides the internal rectus near its insertion, and sliding the point of the scissors under the other recti, he divides them in succession along with the conjunctiva, all round the cornea. Next, he divides the two obliqui, and lastly, the optic nerve, close to the sclerotica. In this method of operating, the hæmorrhage is very slight, as the larger branches of the ophthalmic artery are not divided; the principal nerves of the orbit, with the exception of the optic, are also spared; and a better cushion is left, whereon to place an artificial eye.

5. When the eyeball is enlarged, it will generally be found that the ocular capsule is adherent to the sclerotica, so that the method of operating now described is not available. The muscles, the orbital tissues, and the lacrymal gland, are also so much implicated in many cases, that they require to be removed. In this case, the lids being held asunder by the assistant, and the eye carried upwards and outwards by means of the ligature, the operator plunges a double-edged scalpel directly backwards into the orbit, between the eyeball and the internal canthus, and then carrying the instrument round, he separates the eyeball from the lower eyelid, by a division of the conjunctiva. Next, moving the eye inwards and downwards, the connection of the upper part of the conjunctiva is disunited, the scalpel passing round the eyeball to the inner canthus. In this part of the operation, care should be taken to leave as much of healthy conjunctiva as possible, especially if it is contemplated that the patient should wear an artificial eye. The cellular connections between the

muscles of the eye and the walls of the orbit are next to be divided, and the inferior oblique muscle cut across near its origin, the directions of the sides of the orbit, and the thinness of its roof, being carefully borne in mind. The optic nerve, surrounded by the origins of the recti, at last forms the only remaining connection which prevents the complete extraction of the eye. Dragging the eye forward by means of the ligature, the nerve, thus put on the stretch, along with the origin of the recti and superior oblique, is to be divided with the scalpel, or the strong curved scissors recommended for this purpose by Louis, and commonly called Louis' scissors. The nerve ought to be cut as close to the optic foramen as possible.

6. As soon as the bleeding from the branches of the ophthalmic artery has ceased, the operator examines the orbit with his index-finger, in order to discover whether any of the diseased substance be left behind. If there is any such, it must be dissected out. The lacrymal gland also, if diseased, is to be laid hold of with a pair of forceps, and removed with the scissors. Indeed, it is often deemed a safe precaution, in cases of scirrhus, fungus hæmatodes, or melanosis, that the whole soft parts should be removed, leaving only the periorbita. The muscles are very liable to be affected in cases of scirrhus; if they be so affected, any portion of them left in the orbit, gives rise to a fatal renewal of the disease. In some cases, the bones are implicated, and it may be proper to attempt the removal of the portion of them which is diseased. This is particularly apt to happen in cases of scirrhus, originating in injuries. A pair of cutting pliers and other instruments should, therefore, be provided for this purpose.

7. It was formerly the practice, after the extirpation was finished, to stuff the orbit with lint, rolled up into a ball, and surrounded by a thread, which was left hanging from between the eyelids. This is now generally laid aside, being likely to excite inflammation, which might extend to the membranes of the brain. The lids are merely brought together, and covered with a piece of spread lint, a light compress, and a roller. It cannot be denied, however, that such a procedure favours union between the lids and the areolar tissue left in the orbit, and may thereby impede or entirely prevent the application of an artificial eye after recovery from the operation. If the lids have been disunited by an incision carried from their outer angle towards the temple, the edges of the wound are to be brought into contact, and kept so by a stitch or two; and if any accidental cuts have been made in the lids, they are to be neatly brought together in the same way.

8. As for the hæmorrhagy which occurs during or after extirpation of the eye, the free exposure of the bleeding vessels to the air for a few seconds, or the injection of cold water into the orbit, is in general sufficient to produce their contraction. We are of course provided, however, with the tenaculum, and ought to tie any considerable vessel within reach, which may continue to bleed. If bleeding goes on to any great extent from the deep part of the orbit, pressure must be had recourse to. Sometimes the pressure of the finger for a few minutes is sufficient, but in other cases it is necessary to introduce to the bottom of the orbit a conical roll of lint, pressing

it against the bleeding orifice of the ophthalmic artery for some minutes, and then removing it. Should the hæmorrhage still continue, the orbit must be stuffed with lint, against which the lids being supported by a double-headed roller going round the head, the bleeding is completely checked. The lint may be left in the orbit for two or three days.

9. It occasionally happens that a disease of the eyelids has extended to the eyeball, or that a disease of the eyeball has propagated itself to the eyelids, and that the eyelids are either adherent to the eyeball, present a number of irregular prominences and fungosities, or have become affected with ulceration. In such circumstances, it may be judged necessary to remove the eyelids as well as the eyeball. In this case, the best plan is to divide the lids round their base, including all the diseased parts, then, by the incision thus formed, pass a ligature through the eyeball, and proceed to extirpate the eyelids and eyeball together. It is amazing how rapidly the edges of the extensive wound left after this operation, close in upon the orbit, and ultimately cover it completely.

10. The patient must be kept quiet, fed on spoon-diet, and his bowels carefully attended to. In general, little or no fever, and no bad effects of any kind, follow the operation. The clotted blood which fills the orbit dissolves, granulation follows, and the cavity is partly filled by newly formed areolar tissue. It sometimes happens, however, especially if lint has been left within the orbit, that violent inflammation ensues, followed by suppuration, within that cavity, in the eyelids, under the integuments of the forehead, or even within the cranium. Mr. Travers mentions that he lost a patient, a middle-aged countryman, otherwise in health, within a fortnight after the operation, owing to a suppuration of the dura mater, on the same side of the head. The attack of inflammation was sudden and rapid, commencing about a week after the operation, and ushered in by a severe rigor, after imprudent exposure to cold.[5]

11. An artificial eye can rarely be used with good effect after extirpation of the eyeball; never, indeed, if the eye had naturally been large and prominent. If it had been small and sunk, the lids narrow, and only the ball removed, the application of an artificial eye may in some degree succeed. Dieffenbach attempted to fill the orbit by a flap taken from the temple, and thus form a cushion for an artificial eye.[6]

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[1] O'Ferrall, Dublin Journal of Medical Science; Vol. xix. p. 355; Dublin, 1841.

[2] Annales d'Oculistique; Tome vii. p. 30; Bruxelles, 1842.

[3] Ib. p. 31.

[4] Lancet, October 21, 1851, p. 386.

[5] Synopsis of the Diseases of the Eye p. 309; London, 1820.

[6] Journal Complémentaire des Sciences Médicales; Vol. xl. p. 391; Paris, 1831.

CHAPTER XIX.

ARCUS SENILIS.

Syn. — Gerontoxon externum et internum. Marasmus senilis corneæ et lentis. Macula arcuata. Arcus senilis adiposus, *Canton.*

Fig. Ammon, Thl. I. Taf. IX. *fig.* 22. Taf. VII. *fig.* 11. Taf. IX. *figs.* 1, 2. Taf. XIX. *fig.* 13.

In old people, the cornea, at a small, but variable distance, within its circumference, not unfrequently presents an opaque ring of a whitish colour, more or less broad, and more or less complete. The opacity is often semilunar, and is situated at the upper or lower edge of the cornea. This *arcus senilis*, as it is termed, occurs without any previous inflammation, and has generally been ascribed to a diminished nutrition or marasmus of the part. Mr. Canton[1] has demonstrated, what appears to have been surmised[2], that it is a fatty degeneration, innumerable oil-globules being found between the layers of the cornea at the part affected, on submitting a thin section of it to the microscope. The anterior and posterior elastic laminæ are entirely free. A somewhat similar opacity is occasionally seen in young people[3], but this seems to depend merely on an unusual overlapping of the sclerotica, or on a loss of transparency from atrophy of the cornea. Such a state is sometimes the result of injury and inflammation, and in the course of years may become very broad. Instead of an arched form, it sometimes presents that of a segment of a circle, or of two segments uniting at an angle.

An arcus senilis, closely examined, is seen to consist of two arches or rings, the outer of a grayish-white colour, and which seems to be an encroachment of the sclerotica on the cornea; the other of a milky colour, which is the result of fatty degeneration. These two arches are separated by a portion of cornea which is clear, and which, while it seems depressed, is probably weaker than natural, for I have known it burst by an accidental blow with the person's own thumb, allowing a large protrusion of the iris. The inner arch sometimes encroaches towards the centre of the cornea, so as to leave only so much of it uncovered, as corresponds to a moderately sized pupil.

Mr. Canton has in no instance found arcus senilis, when well developed, unaccompanied by fatty degeneration of the muscles of the eye, and of the heart. Arcus senilis, therefore, in cases of embarrassment of the circulation and respiration, not referrible to any other lesion, may be regarded as affording some ground for suspecting the muscular fibres of the heart to be changed into fat. I believe, however, that many cases of fatty degeneration of the heart occur, without any accompanying arcus senilis.

We owe to Dr. Ammon[4] the observation, that in those eyes where there is an arcus senilis of the cornea, a similar opaque ring is apt to exist round the margin of the crystalline body. The first time he noticed this, was in the left eye of a woman of 62 years of age. The lower half of the edge of the cornea presented an arcus senilis. The upper half, as well as the right cornea, was perfectly transparent.

On dissecting the left eye, Dr. Ammon was greatly surprised to find a crescentic opacity of the lower edge of the lens, exactly corresponding to the arcus senilis of the cornea. The capsule was perfectly natural.

Subsequent investigations by Dr. Schön[5] have shown that arcus senilis of the crystalline body affects the posterior capsule more frequently than the lens; but that, in some instances, both the posterior capsule and the lens are partially opaque, the opacity corresponding pretty nearly, in form and extent, to that of the cornea. The opacity at the edge of the lens is partly formed by streaks radiating inwards. No arcus senilis appears to have been detected in the anterior capsule. In several cases of external and internal arcus senilis, Dr. Schön found the ophthalmic artery ossified.

Such opacities of the crystalline body as are described by Ammon and Schön, Mr. Canton has never met with in any of his numerous dissections. He is, therefore, led to believe their occurrence to be accidental.

Arcus senilis has not been regarded as of much importance in a practical point of view, except with regard to the section of the cornea, in extraction of the cataract. A broad arcus senilis has been stated as an objection to extraction, on account of the difficulty with which the incision unites, if it be carried through the opaque portion of the cornea. This alleged difficulty of union, however, does not always occur; for I have seen the section of the cornea through an arcus senilis heal with perfect facility.

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[1] Lancet, May 11, 1850, p. 560; January 11 and 18, 1851, pp. 35, 66.

[2] Schön, Ammon's Zeitschrift für die Ophthalmologie; Vol. i. p. 162; Dresden, 1831: Middlemore's Treatise on the Diseases of the Eye; Vol. i. p. 456; London, 1835.

[3] Wardrop's Morbid Anatomy of the Human Eye; Vol. i. p. 88. 144., Pl. I., fig. 1. Pl. VII., fig. 3.; London, 1819. Ammon represents a similar opacity as the result of inflammation of the orbiculus ciliaris, in his Darstellungen; Theil i. Taf. i. figs. 11, 12. Dalrymple gives a figure of a congenital case of annular encroachment of the sclerotica; Pl. xxxiv. fig. 2.

[4] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xiii. p. 114: Berlin, 1829.

[5] Op. cit. pp. 119. 151.

CHAPTER XX.

CATARACT.

Syn.—Γλαύκωμα, *Hippocrates.* Ὑπόχυμα ἤ ὑπόχυσις ὑγροῦ, *Galen.* Suffusio, *Celsus.* Gutta opaca. Aqua; aqua descendens in oculo; aquæ descensus, vel cataracta, *Latino-barbarous translators of the works of Albucasis and other Arabians.* Caligo lentis, *Cullen.* Der graue Staar, *Germ.*

SECTION I.—DEFINITION AND DIAGNOSIS OF CATARACT; METHOD OF EXAMINING CASES OF THE DISEASE; CAUSES AND PROGNOSIS.

By the term *cataract*[1] is understood an opacity situated between the vitreous humour and the pupil.

Enumerating the parts so situated, we have, *first*, the posterior hemisphere of the crystalline capsule; *secondly*, the crystalline lens; and *thirdly*, the anterior hemisphere of the crystalline capsule. Any of these parts may lose its natural transparency, and there will then be formed a *capsular* or a *lenticular cataract*, according as the opacity is seated in the capsule or the lens. Between the internal surface of the capsule and external surface of the lens there exists, in the natural state, a considerable degree of adhesion, through the medium of the intracapsular cells of Werneck; but in consequence of disease, the natural cohesion of the lens to the capsule is sometimes destroyed, and an opaque fluid is deposited between them, forming what is termed a *Morgagnian cataract.* Any opacity situated *in* or *within* the crystalline capsule, is termed a *true cataract*, and it is evident that all those above enumerated fall under this denomination.

Between the anterior crystalline capsule and the pupil lies the aqueous humour of the posterior chamber. This cannot become opaque, without the whole of the aqueous humour being similarly affected; but it may be displaced by an opaque substance; such as coagulated lymph, pus, blood, or pigment from the uvea. Such a cataract is termed *spurious*, and has its seat *without* the capsule.

Practitioners in former ages were of opinion that cataract was owing to the effusion of a humour (ὑπόχυσις ὑγροῦ) between the uvea and the crystalline, which, becoming gradually consolidated, covered the anterior surface of the crystalline in the manner of a veil; and that sight was restored by depressing the concreted humour with the needle. The erroneousness of this opinion was demonstrated in the course of the seventeenth century by Lasnier, Rolfink, Borel, and others, dissection showing that, while a membranous or spurious cataract sometimes forms within the pupil, true cataract is an opacity of the crystalline body itself.

Whether cataract be true or false, the opacity of a part, naturally transparent, necessarily stops in a greater or less degree the light which should be transmitted through the interior of the eye; the impression on the retina is consequently rendered imperfect; and partial blindness ensues. Cataract never produces total blindness.

When the term *cataract* is used without any appellative, lenticular opacity is generally meant. For instance, when we say that cataract is a slow disease, occupying months or years in its progress, it is of lenticular cataract that we speak; for all the others, and especially the spurious kinds, may be the product of a few days or hours. It would appear, however, that even lenticular cataract is sometimes fully developed in a very short space of time. Richter relates a case in which cataract was formed in the course of one night. A patient, labouring under gout, accidentally exposed his feet to a great degree of cold during the night, in consequence of which the gout retroceded, and he was deprived of sight. Richter saw him next morning, and found a complete pearl-coloured cataract.[2] Mr. Wathen was of opinion that blacksmiths, and all mechanics who work near large fires, were more subject to cataracts than other persons, and he mentions that he had had two patients who were instantly seized with cataract, at the very time they were thus employed.[3] Dr. Martin, of Portlaw, at a meeting of the Surgical Society of Ireland, related two cases of the sudden formation of lenticular cataract. The one occurred in a cachectic woman who, after sitting up for several nights with her invalid mother, and crying a great deal, awoke one morning with her lenses semi-opaque, and presenting the appearance of being stellated from the centre, as if breaking up during maceration. The other was in a man, who having been married to a farmer's daughter, retired to bed, after the usual fun of an Irish wedding, his eyes being perfect, and awoke early in the morning, with his sight greatly impaired from cataracts.[4] I have not witnessed any such sudden formation of cataract in eyes previously sound. A patient, however, was attending at the Glasgow Eye Infirmary, with glaucoma and amaurosis of one eye, but without any appearance of cataract, and was present as usual, on a Monday or Wednesday, the eye exhibiting exactly the appearances which it had done for some months before. On the Friday, I was surprised to find the surface of the lens completely opaque, and stellated by lines radiating from its centre.

Diagnosis.—It is of much importance that we should distinguish incipient cataract from incipient amaurosis. In the fully developed state, these two diseases can scarcely be confounded by any one in the least acquainted with the diseases of the eye; but in the early stages, such a mistake may readily be committed, and may be productive of serious bad consequences. For example, if a patient with incipient amaurosis presents himself to a practitioner who mistakes the case, and supposes it to be one of incipient cataract, the advice which he will give, will be to wait with patience till the disease be fully developed, and then to submit to an operation. Should the patient return after some months with a fully developed amaurosis instead of a cataract, the practitioner would necessarily feel that, by his ignorance or inattention, he had lost the only season for treating an amaurotic affection with success. The opposite mistake would probably lead him to the employment of depletion, mercury, and counter-irritation, by which his patient's health might be seriously compromised, but which could have no effect in removing an incipient opacity of the lens.

The symptoms of cataract and amaurosis, as indeed of all diseases whatever, are *subjective* or *objective;* that is to say, they consist either in certain feelings which the *patient experiences*, as impaired vision, headache, giddiness, &c. or in certain changes which the *observer perceives* in the form, colour, texture, consistency, vascularity, and mobility of the different parts of the organ of vision. Both sets of symptoms will require to be very closely examined in suspected cases.

Subjective, or physiological signs.—1. As to the impaired state of vision which attends these diseases in the incipient stage, the patient affected with either, finds a difficulty in discerning objects with distinctness. In cataract, this difficulty generally increases slowly for a time, and is compared to what might be produced by a diffused mist, thin cloud, or gauze, intervening between objects and the eye, and gradually becoming thicker, till at length it becomes so thick that every thing seems concealed by it: whereas, in amaurosis, the attack is often sudden, and being partial, is described as a dark spot or spots, occupying certain parts only of the field of view, but rendering vision altogether so confused, that small objects cannot be distinguished. With common muscæ volitantes, or *floating muscæ*, as they are often called, neither cataract nor amaurosis has any connection. The dark spots seen in amaurosis are what are called *fixed muscæ*, and when the eyes are closed and shaded from the light, are generally replaced by shining spectra. It is a fact, however, which strikingly illustrates the uncertainty which attends the diagnosis of cataract and amaurosis, that the latter not unfrequently declares itself in the early stage by the sensation of a gauze or mist which, slowly increasing in density, at length totally deprives the patient of sight. So complete a degree of blindness never occurs in cataract. That, however, is of little consequence, so far as the diagnosis in the incipient, not in the advanced stage is concerned.

2. We generally find that the sensation of a mist or cloud is perceived most when the cataractous patient looks straight forward, and that he sees considerably better when he looks sideways. This circumstance might appear likely to afford ground for distinguishing incipient cataract from amaurosis, were it not well ascertained that also those who begin to be affected with diminished sensibility of the retina, are in many instances able to see things placed to one side, much better than what stands directly before them; and that some in whom amaurosis is even far advanced, continue to see only when they look inwards or outwards, while in every other direction they see very obscurely, or not at all.[5]

3. The different degrees of light in which those affected with incipient cataract or amaurosis see best, are worthy of attention. In those cases in which vision begins to fail from diminished sensibility of the optic nerve, there is in general a desire for increase of light; when the patient reads with candle-light, he brings the book close to the candle; and his period of most distinct vision is noon-day, when objects are most brilliantly illuminated by the sun. This is the very time when the cataractous patient sees worst. So much light causes the pupil to contract, fewer rays of light enter the eye, and hence vision is obscure; but in the twilight, when the pupil is dilated, more light is admitted, and the patient finds his vision improved. To witness the effects of moderating the intensity of the light, and thus allowing a greater quantity of it to penetrate to the retina, we require only to make the patient look to and from the window. In the former position, he sees perhaps very little; but turn his back to the light, and he instantly discerns, more or less distinctly, every object around him. Yet even this must not be absolutely depended on. We meet with amaurotic patients to whom strong light is distressing, and who see best with a moderate degree of illumination.

4. To the patient affected with incipient amaurosis, the flame of a candle generally appears broken and confused, iridescent, and spreading out into rays. To him who has an incipient cataract, a candle or a street lamp seems expanded into a large globe of weaker light; it looks, to use the phrase of a countryman at the Glasgow Eye Infirmary, as if "every lamp was as big as a corn-sieve."

5. In incipient cataract, the patient sometimes sees, with one eye,

objects multiplied. Looking at the moon, for instance, he sees three or four moons. This does not occur, I think, in incipient amaurosis, although diplopia, with both eyes open, is common.

6. It is rarely the case that incipient amaurosis is not attended by a variety of other subjective symptoms besides failure of sight; especially by headache, vertigo, and derangement of the digestive organs. Incipient lenticular cataract most frequently occurs without any such combination of complaints.

Objective or anatomical signs.—1. The gait and aspect of the amaurotic patient are different from those of the cataractous. The latter approaches with his eyes shaded with his hand, and his head turned downwards and to one side, so as to dilate his pupils, and see past the obstruction. The former stalks on with a vacant expression, looking forwards and upwards. There are few cases of amaurosis, even in the incipient stage, in which the natural movements of the eye are perfectly retained. No impediment of this kind is present in cataract; the patient opens the eyes, and converges them towards objects, without the least difficulty, and in a manner perfectly natural. But in almost all cases of amaurosis, we may observe a want of direction in the eyes, or even an approach to strabismus.

2. The mobility of the iris affords a valuable ground for diagnosis; for in incipient cataract, the pupil contracts and expands as extensively and as vividly as in the healthy state of the eye; whereas in incipient amaurosis, if the pupil is not already dilated and fixed, its motions generally are limited and slow. If we apply bellanonna for the purpose of dilating the pupil, in half an hour this is fully accomplished, if the case be one of cataract; but after several hours, there is often but little dilatation produced, if amaurosis be present.

3. It is rarely the case in amaurosis, even in its incipient stage, that the pupil, except in young subjects, presents the jet-black colour of health. The appearance, however, is not so much an actual opacity, as a paleness, or greenishness. This symptom is what is termed *glaucoma*, which has by mistake been attributed to opacity of the vitreous humour. Dissections of the eye in the state of glaucoma have convinced me that yellowness of the central part of the lens, without opacity, is the cause of the greenish reflection; that the lens has in fact become dichromatic, reflecting the mean rays of the prismatic spectrum, and hence appearing green while seated in the eye; but on being viewed by transmitted light out of the eye, showing the colour of amber. I am speaking of incipient glaucoma; for in the advanced stage, the kernel of the lens is dry, of a reddish-brown colour, and has lost in part its transparency.

To distinguish glaucoma from cataract, especially in the incipient stage, proves to beginners one of the most difficult pieces of diagnosis, and sometimes not to beginners only, but to those who for a length of time have attended to the diseases of the eye. A gentleman was sent to me by his brother, a medical practitioner in the country, desirous to know if I thought the cataracts, which he said I would see in his eyes, were ready for operation. The disease was glaucoma, with a great degree of shortness of sight, but without any cataract. With much difficulty could I convince the practitioner of the real nature of the case, so wedded was he to the opinion that the appearance which he saw through the pupil, was cataract.

Attention to the following circumstances, will in general enable the observer to discriminate between glaucoma and cataract: —

α. The cloudiness in glaucoma is always of a greenish hue; whereas, in incipient cataract, the opacity is whitish, or of the bluish tint of milk and water.

β. The opacity in glaucoma is best seen when we look directly into the pupil; and disappears in a great measure, or altogether, when we look sideways into the eye. In cataract, the opacity is seen whether we look sideways or directly.

γ. In glaucoma, the disease appears to be seated at a considerable distance behind the pupil, or even deep in the vitreous humour; the superficial laminæ of the lens are evidently not involved, and the opacity seems surrounded by a broad transparent ring. In lenticular cataract, the opacity evidently affects the surface of the lens, is close behind the pupil, and appears bounded by the edge of that aperture. In posterior capsular cataract, the opacity is deep in the eye, but is always streaked; whereas the glaucomatous reflection is always uniform; never spotted, nor radiated.

δ. When we examine narrowly the surface of a cataractous opacity, especially while concentrating the light upon it by means of a double-convex lens, it generally appears slightly rough, and somewhat dull; in these respects forming a striking contrast to the smoothness and lustre of the glaucomatous opacity.

ε. The eyeball, in cases of amaurosis combined with glaucoma, always feels firmer than natural; while in cataract, it presents its usual degree of resistance to the pressure of the finger.

ζ. Having dilated the pupil of the suspected eye by means of the extract of belladonna, or the solution of atropine, the crystalline should be examined catoptrically, according to the method of Purkinje. The observer and the patient should be placed in a room from which the daylight is entirely excluded; the patient should be seated so that the observer may look rather down into the eye than up; a candle used which burns steadily and does not blaze much; and the candle shaded by the hand of the observer, so that its light does not fall into his eyes.

When a lighted candle is held before a healthy eye, at the distance of a few inches, three reflected images of it are seen, situated one behind the other. Of these, the anterior and posterior are erect, the middle one inverted. The anterior is the brightest and most distinct; the posterior, the least so. The middle one is the smallest. The anterior is formed by the cornea; the middle, by the posterior surface of the crystalline; the posterior, by its anterior surface. In the formation of these images, the cornea and the anterior surface of the crystalline act as convex mirrors; the posterior surface of the crystalline, as a concave mirror. The focus of the inverted image is positive, and is situated within the crystalline. The deep erect image has a virtual focus, situated in the vitreous humour. The superficial erect has also a virtual focus, in the aqueous humour. When we move the candle, the erect images move in the same direction; the inverted one, in the opposite direction.

In cataract and glaucoma, the superficial erect image which is formed by the cornea, suffers no change. Cataract, even at an early stage, obliterates the inverted image, and renders the deep erect one very indistinct. Glaucoma, only when much advanced, obliterates the inverted image; while, in all its stages, it renders the deep erect one more evident than it is in the healthy eye.

In estimating the changes which occur in the appearances of the images reflected from the eye in its several diseased states, it is necessary, as Dr. Staberoh has remarked[6], to take into account two sources of these changes; viz., the state of the surfaces which form the images, and that of the media through which we see them.

The following particulars are worthy of careful attention: —

(1.) In incipient glaucoma, or what we may call the *first* stage of the disease, both the deep erect image and the inverted one are distinct. The deep erect image is rather larger and brighter than in the healthy eye. It is also somewhat of a yellow hue. With the advance of glaucoma, the inverted image also becomes larger, and of a yellowish colour. Its outline becomes sooner diffused than that of the deep erect image.

(2.) In mean cases, or what we may call the *second* stage of glaucoma, the inverted image is pretty distinct, when formed near the edge of the crystalline. If it is the right eye which is the subject of examination, and if the observer moves the candle towards the right side of the patient, the inverted image will be seen behind the nasal edge of the pupil; but if the candle be brought slowly in front of the eye, the inverted image, as it moves across the pupil, is seen to become less and less distinct, and in some cases is altogether extinguished; till, on the candle approaching the patient's left side, the inverted image re-appears behind the temporal edge of the pupil, being again formed by the circumferential portion of the posterior capsule. No such appearance as this is seen in lenticular cataract, a disease which speedily affects the superficial laminæ of the lens in such a way as to prevent the formation of the inverted image by any part of the posterior surface of the crystalline body. The extinction of the inverted image, when the candle is placed directly before the pupil of an eye affected with glaucoma of the second degree, is owing to a loss of transparency in the kernel of the lens, which suffers, as I have already mentioned, a peculiar degeneration, characterised by dryness of substance, and a reddish-brown colour.

(3.) In complete lenticular glaucoma, or glaucoma in the *third* stage, the inverted image is no longer visible, even at the edge of the lens.

(4.) The deep erect image is better seen in the second and third stages of glaucoma than in the healthy eye. It is large and evident; but its outline is not so sharp, so that it often appears like a diffused blaze. The fact that it is more distinct than in the healthy eye is to be attributed to the reddish-brown kernel of the lens acting as a foil to the image.

(5.) In incipient lenticular cataract, the inverted image, though changed neither in colour nor in size, is indistinct, and its outline as if washed off. It is extinguished before any opacity is visible, and consequently long before the cataract is fully developed; a fact of the greatest importance in the diagnosis which we are now considering. In capsulo-lenticular cataract, the inverted image fades sooner than in mere lenticular cataract; and even when the capsule, or the superficial substance of the lens, seems to be alone opaque, the inverted image disappears much sooner than might be expected from the apparently moderate degree of opacity.

(6.) In lenticular cataract there is merely a general reflection, but no distinct image, from the anterior surface of the crystalline body.

(7.) If the lens is not in its place, but has been absorbed in consequence of an injury, been removed by an operation, or fallen down into a dissolved vitreous humour, neither inverted nor deep erect image is formed.

(8.) In the diagnosis of incipient cataract and incipient amaurosis, the catoptrical test is, in ordinary cases, decisive; for in amaurosis uncombined with glaucoma, the three images are distinct, while in even in the early stage of cataract the inverted image is obscure or extinct. The diagnosis of incipient cataract and incipient glaucoma requires the catoptrical test to be familiar to the observer, else he may not distinguish that, when the candle is held in the axis of the eye, the inverted image is indistinct in both diseases; but whenever it is moved to one side, it becomes distinct in glaucoma; whereas in cataract, it either remains as obscure as before, or from the circumferential part of the lens being more affected than the central, it is obliterated.

(9.) It must not be omitted to be stated, that there are cases of combined cataract and amaurosis, which, along with a sluggish pupil and very deficient vision, present, even in an early stage, no inverted image.

(10.) Even a slight degree of spurious cataract causes obliteration of the inverted image. In cases of this sort, I have known the inverted image totally invisible, till after the free action of aloes and blue pill on the bowels, and smart counter-irritation behind the ears by tartar emetic plasters; by which means absorption was probably excited of some thin stratum of deposit in the pupil, so that the inverted image again became distinct, along with a considerable improvement of sight. This shows the propriety of having recourse to frequent catoptrical examination of the eye in the course of treating such cases.

η. Glaucoma proceeds in general very slowly in its course. Years pass over without much more appearance of opacity than what was at first observed, and with little or no further loss of sight; while in cataract, vision generally declines rapidly, keeping pace with the growing opacity.

Circumstances to be attended to in cases of cataract.—To ascertain with accuracy the existence of cataract, and the nature of any cataract which may present itself, it is necessary to attend minutely to the following circumstances: —

1. The *opacity*; its colour, extent, form, and seat. Whiteness denotes either a dissolved lens, or a capsular cataract; grayness, a lenticular cataract; amber, or dark grayness, that the lens is hard; light grayness, that it is soft. If the whole extent of the pupil is uniformly opaque, the cataract is lenticular; if the opacity is streaked or speckled, it is more likely to be capsular. If opaque streaks radiate from a centre, it is probable that the exterior lamellæ are chiefly affected, or that the posterior hemisphere of the capsule is the seat of the disease; if the form of the streaked opacity is convex, that the anterior hemisphere of the capsule is the part affected; if concave, the posterior hemisphere. With the light concentrated on the pupil by means of a double-convex glass, all these particulars are carefully to be ascertained.

2. The *iris* is to be examined; its colour, mobility, form, situation, and the shadow it throws upon the cataract. Is it green, or otherwise discoloured, denoting previous inflammation, which may have left the eye in a state unfavourable for any operation? Covering the eye which we are not examining, that all sympathetic motion of the iris may be avoided, we examine whether the pupil moves briskly, and extensively, as in health; or slowly, and to a very limited degree, so as to lead to the suspicion of the retina being imperfectly sensible. Is the pupil fixed and irregular, as if adherent to the capsule, in consequence of effused lymph; or does the iris tremble on every motion of the eye, an appearance denoting a paralytic state of its fibres, attended by a dissolution of the vitreous humour and generally by amaurosis? Is the iris convex, and nearer to the cornea than natural, an unfavourable circumstance for the operation of extraction? Is the shadow thrown by the iris on the opaque body distinct, or is there no shadow? This depends on the distance of the opaque body from the iris, or, in other words, the depth of the posterior chamber. If there is no shadow, the posterior chamber is probably obliterated by the pressure of a large and soft lenticular cataract. If the shadow is distinct, the lens is probably small and hard; and at any rate does not exceed its normal bulk. Does the iris present a funnel shape, the pupil being drawn back? This appearance denotes that the lenticular body is reduced in size.

3. The *eyeball in general* deserves attention; its colour, degree of firmness, size, and place in the orbit. A dingy colour of the sclerotica marks ill health, which, of course, is unfavourable for attempting an operation. A flexible cornea or sclerotica marks deficiency of vitreous humour, attended by amaurosis. A stony hardness of the eye denotes glaucoma, with a superabundance of dissolved vitreous humour. An eye considerably below the medium size never recovers more than a very imperfect degree of sight. A very prominent, or a very sunk eye, is unfavourable for extraction. In the former case, if the section of the cornea be made downwards, the lower lid tends to intrude between the lips of the wound, and keep

it from healing. In the latter case, the section of the cornea necessary for extraction can scarcely be performed.

4. The *degree of vision* must be carefully examined, both as denoting the sentient state of the retina, and serving to determine the propriety of an immediate operation. If the patient can distinguish the objects around him, while regarding them with his back turned to the light, the operation ought to be deferred till the sight is more obscured. If, when turned to the light, he distinguishes the shade cast by the hand when it is moved before him, the retina is sensible, and the operation may be performed with some prospect of success. If he sees the shadow of a single finger cast on his eye at the distance of 12 inches, the retina is quite healthy.

5. The *mobility of the eye* is a point of considerable importance. A squinting eye, or one which moves readily only in one direction, or with which the patient perceives the light only when the eye is turned very much in one direction, is not likely to be much benefited by the removal of a cataract. The operation of extraction may be greatly impeded by the eye being incapable of moving in every direction, as the operator may desire.

6. The *age of the person* affects materially the consistence of the lens, whether in health or disease. Soft in childhood and in youth, firm at middle age, hard in old age, the lens affected with opacity may readily be divided in the first two periods by the needle, and will dissolve in the aqueous humour, while in the last two, these processes may be difficult or impracticable.

7. The young practitioner ought never to pronounce absolutely even on the existence of cataract, without dilating the pupil by *belladonna*, and examining the eye *catoptrically*; and the most experienced may derive advantage from exposing in this way the whole field of the disease to his view, and testing the state of the crystalline. Marginal cataract would often escape detection, were the pupil not fully dilated. It is important also to observe the degree of celerity with which the pupil yields to the influence of belladonna. (See p. 741.)

Proximate causes.—1. The most frequent kind of cataract is that which occurs independently of inflammation or injury, and which we meet with so often in persons far advanced in life. We ascribe this variety of cataract to a defective nutrition, gradual decay, or marasmus of the lens.[7] But in fact we are unacquainted with the proximate cause of this sort of cataract. Old age is certainly not its sole exciting cause, for we meet with it in young persons and even in infants. The process has been supposed to begin in the central part of the lens, at the greatest distance from its source of nourishment, and to spread slowly to the ambient strata; but this is certainly incorrect. If we examine a cataractous lens immediately after it has been extracted, we find the whitish opacity which constitutes cataract and has impeded vision, to affect principally its superficial laminæ; the interior lamellæ being generally pretty transparent, although often presenting the amber or the reddish-brown hue of glaucoma. The superficial laminæ of a cataractous lens, not only present a state of opacity, but appear to have undergone a peculiar change, which, by some, has been compared to a coagulation, and by others to a necrosis, and which is entirely wanting in the purely glaucomatous state of the lens.[8] In cataract, the lens also loses its natural adhesion to the internal surface of the capsule; in some cases a fluid, arising from the disintegration of the superficial laminæ, is deposited within the capsule; while in others, the whole lens is softened, or reduced to the condition of a fluid.

2. Next in point of frequency is cataract from injuries. These, rupturing the capsule, will admit the aqueous humour into contact with the lens. Even the smallest puncture of the capsule will bring on lenticular cataract. If the rupture of the capsule is considerable, in four-and-twenty hours we see a considerable portion of the lens opaque; an effect attributed to the coagulating influence of the aqueous humour.

Should the rupture of the capsule remain open, the whole lens, in a young subject, may dissolve in the aqueous humour, be absorbed, and thus the pupil clear. In this case, opaque portions of the capsule often remain visible, although by the dissolution of the lens a considerable share of vision is restored. If the wound of the capsule closes, the dissolution of the lens ceases, the cicatrice of the capsule assumes a chalk-white appearance, and thus a particular variety of capsulo-lenticular cataract is formed.

It has been conjectured that the capsule is occasionally ruptured in that tetanic state of the eyes which attends the convulsions of young children, so that the aqueous humour being admitted within the capsule, the lens becomes opaque. In some cases, a blow on the eye, without any penetration of its tunics, ruptures the capsule; while in others, cataract, generally attended by amaurosis, follows a blow on the eye, or a blow or fall on the edge of the orbit, without any apparent rupture or dislocation. This effect may not show itself for several years after the injury. (See Chapter XII. Section iv.)

3. Inflammation is in some cases the proximate cause, not merely of spurious, but even of true cataract. Indeed, anterior and posterior capsular cataracts may be compared to specks of the cornea; while in some instances, the lens also, from long-continued inflammation, becomes opaque, dissolves into a milk-like fluid, or even suppurates. (See Chapter XIII. Section xxx.) Ossification of the capsule and lens is another termination of inflammation in these parts, and has already been spoken of, at page 678. The different varieties of iritis are sometimes followed, not only by opacity of the capsule, but also of the lens. Such cataracts are generally attended by adhesion of the iris to the capsule.

4. In congenital cataract, it is supposed that the lens is opaque at a certain period of the fœtal life, and that an arrest of development leaves it so. Beer's notion[9] that what is called *congenital cataract* is not really so, but arises from exposing the eyes to too much light after birth, is disproved by the fact that we find the disease in several successive children in the same family, and that it is observed immediately after birth.

Remote and predisposing causes.—Many of the remote and predisposing causes of cataract must have escaped detection; but the following are more or less frequent in their operation:—

1. Old age. Of 500 cataract patients treated by Fabini[10], 268 were males and 232 females. Their ages were as follows:—

From 1 to 10 years	14
„ 11 „ 20 „	16
„ 21 „ 30 „	18
„ 31 „ 40 „	18
„ 41 „ 50 „	51
„ 51 „ 60 „	102
„ 61 „ 70 „	172
„ 71 upwards	109
	500

The disposition, then, to cataract is small before the age of 40, but is much increased as life advances beyond that period.

2. Hereditary tendency. Instances are not uncommon of this disease attacking individuals, one of whose parents or near ancestors had been affected with it, about the same period of life; while in other instances, several brothers and sisters are either born with cataract, or possessing a congenital predisposition to the disease, become cataractous in after-life, and about one age.

3. Those who are much exposed to strong fires, as glass-blowers, forgemen, cooks, laundresses, &c. are supposed to be more frequently than others, the subjects of this disease.

4. In the early years of my practice, I met with a greater number of stocking-weavers, affected with cataract, than of any other single trade. The disease was often attended in those persons with amaurosis. Their sedentary life, and the intense looking at an object in motion, which their occupation requires, probably caused their eyes to become thus diseased.

5. The use of wine and spirituous liquors, but especially the former, appears to favour the production of cataract, which is a common disease in all countries where wine is so cheap as to be the habitual beverage of the lower orders.[11]

6. Cataract is said to be frequent among the Turks, and is attributed to the constant use of opium.[12]

7. The inhabitants of volcanic countries, as Naples and Sicily, are said to be very subject to cataract.

8. The sudden application of cold to the extremities of the body, so as to check any natural or morbid effort or evacuation, such as menstruation, or a paroxysm of gout, is apt to produce cataract.

9. As a general rule, the subjects of cataract enjoy good general health. They complain more frequently of rheumatic affections, than of any other; dyspepsia, pains in the head, and giddiness, not unfrequently precede cataract, especially in women; but the majority of cataractous patients have not been troubled with any disease of importance.

10. I have in three instances seen lenticular cataract attack women of from 18 to 25, labouring under diabetes mellitus. I have also met with the same complication in males, at a later period of life.

General prognosis. — The prognosis in cases of cataract must vary considerably according to the particular species which is present, the local complications of the disease, and the age and general health of the patient.

In the incipient stage, we seldom hesitate to prognosticate, especially if the lens itself be the part affected, an uninterrupted increase of opacity and decrease of vision, till a perception of light and shade be all that is retained. Should the anterior hemisphere of the capsule be the seat of partial opacity, the disease may remain stationary for a number of years, or through the whole of life, without affecting the transparency of the lens; but posterior capsular cataract rarely continues long without bringing on lenticular opacity.

With regard to the prognosis, inclusive of the probabilities of cure, practitioners are too much in the way of raising sanguine hopes in the minds of patients affected with cataract, that by surgical operations on the eyes, their sight may be almost perfectly restored, not weighing with sufficient consideration the frequency with which other morbid changes in the organ of vision are associated with this disease, especially in advanced life, such as dissolution of the vitreous humour, and imperfect sensibility of the retina.

The dangers, too, attending the operations for cataract, are much too lightly estimated, in pronouncing an ultimate prognosis. The risk of a badly performed operation, and that of disorganisation from inflammation and other causes after even the best-performed one, are too much kept out of view. Much depends on the style in which the operation, whatever it be, is executed, and much on the conduct of the after-treatment. Many operators on the eye seem to think that they have done enough, when by the publication of a few successful cases, they have persuaded the profession and the public of their expertness; but unless the circumstances of each case are minutely detailed, and a history given, not of select cases, but of every case occurring during a year, or longer period, and each history brought down, not merely to a few days or weeks after operation, but to a year or more, no conclusion can be drawn regarding either the abilities of the operator, the merits of his particular mode of operating, or the general success of operations for the cure of cataract. Such facts only as the following are capable of serving as data for an ultimate prognosis in cataract: —

1. The Royal Academy of Surgery, solicitous to know the truth with respect to Daviel's success, applied to M. Caqué, one of their correspondents, who resided at Rheims. This gentleman by a letter dated 15th January, 1753, informed them, that Daviel had there operated on 34 cases; 17 of which were perfectly restored to sight, 8 saw indifferently, and 9 received no benefit.[13]

2. In June 1753, La Faye, Poyet, and Morand, operated the same day upon 19 cataracts; the two former by extraction, although each according to his own method; Morand, by depression. Of those operated on by La Faye, two saw well, two indifferently, and two received no benefit. Two of Poyet's cases saw well, two less, one could discover only daylight, and two nothing. Three

of Morand's patients could see tolerably well, and three remained as dark as before.[14]

3. Mr. Sharp, in a paper read before the Royal Society, 22nd November, 1753, gives an account of his having performed the operation of extraction on 19 eyes, with about half of which he had what he thought tolerable success; though he grants that not a single one escaped a considerable degree of inflammation.[15]

4. Dr. Tartra[16] has published the results of the operations for cataract, performed in the *Hôtel Dieu* at Paris, from the commencement of 1806 to 1810 inclusively. The total number of cases was 113, 70 of which were extracted, and 43 displaced: 19 of the 70 extractions, and 24 of the 43 displacements were successful; 6 extractions and 4 displacements, were followed by partial success; 8 extractions and 5 displacements, were total failures; and the results of the rest were either unknown, or more or less unfavourable. Dr. Tartra observes, that by adding to the 43 successful cases, the other 10, where the operation was attended by partial success, it appears that nearly half the patients operated on obtained a greater or less degree of sight. He adds that it is generally thought that two out of five patients operated on for cataract recover their sight.

5. During the year 1830, the autumn of 1832, and the spring of 1833, Professor Roux operated by extraction, on 115 patients, and 179 eyes, at the *Charité* in Paris, with the following results:—

73 patients recovered sight, viz. .	40 men. 33 women.
97 operations succeeded, in .	52 men. 45 women.
72 operations failed, in . .	32 men. 40 women.
10 partially succeeded, in . .	6 men. 4 women.

Professor Roux was successful then, in somewhat more than five out of every eight patients on whom he operated, and in somewhat less than five out of every nine eyes.[17]

Such is a specimen of the data on which to found a prognosis of the cure of cataract by operation, furnished from the practice of general surgeons, some of whom were probably not very minutely acquainted with the diseases of the eye, nor particularly skilful in the operations for cataract, or the after-treatment. In the practice of one thoroughly acquainted with eye-diseases, able to discriminate the cases fitted for extraction, and those fitted for division, able to perform those operations well, and careful and skilful in the after-treatment, I should think three-fourths of those operated on would recover useful vision, and two-thirds excellent vision.[18]

The constitution of the patient, as well as the state of his eyes, bears strongly on the probabilities of an operation. In a scrofulous or an arthritic subject for example, or in one whose nervous and circulating systems are impaired by the use of wine or spirits, opium or tobacco, an operation for cataract, on account of the danger of inflammation, is not nearly so likely to be successful as in a healthy person. An eye, which, at any previous period, has suffered from serious disease, as small-pox, scrofulous ophthalmia, iritis, and the like, is not likely to be benefited by an operation for cataract.

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[1] The word *καταῤῥάκτης* was never used by the Greeks to signify a disease. The application of the Latin word *cataracta* to a disease of the eye arose in the following way:—*Galen's* name for the disease in question was *ὑπόχυμα* or *ὑπόχυσις ὑγροῦ*, that is to say, "a suffusion or flowing down of a humour;" the Arabians translated this by words which their Latino-barbarous translators rendered literally by "aquæ descensus," from which, as a synonym, arose "cataracta." In one of the Latin editions of *Albucasis*, a chapter is entitled, "De Cura Aquæ quæ descendit in oculo, vel Cataracta." *Du Cange* refers us to the "Acta Sanctorum" for the use of the word *cataracta* as signifying a disease of the eye.

[2] Treatise on the Extraction of the Cataract; translated from the German; p. 3; London, 1797.

[3] Dissertation on the Theory and Cure of the Cataract, p. 12; London, 1785.

[4] Dublin Medical Press, May, 4, 1842; p. 274.

[5] See Hey, Medical Observations and Inquiries; Vol. v. p. 27; London, 1776.

[6] Medical Gazette; Vol. xxi. p. 107; London, 1838.

[7] I have noticed, on dissection, that the lenticular cataract of old persons is occasionally attended by ossification of the arteries of the brain. Is it frequently so accompanied? If frequently, are these two morbid changes connected?

[8] The aid of the microscope, and of chemistry, has been invoked to explain the proximate cause of lenticular opacity.

Rather than opacity of the fibres themselves, Dr. Rainy found white opaque grains deposited between them. Mr. Jones, in an old subject, found the fibres shrivelled and irregular. In hard cataract, Lebert (Lancet, December 27, 1851, p. 604) observed an opaque granular substance between the lamellæ, which were horny and atrophied. In soft cataract, he found an effusion into the intracapsular cells, of a milky fluid, in which crystals of cholesterin were distinguished; the lamellæ being softened and hypertrophied. Davaine found (Gazette Médicale de Paris, Decembre 4, 1852, p. 777) the fibres eroded, their calibre diminished, their surface no longer polished, but uneven, like that of a file, their transparency much changed, and their texture falling into pieces much more readily than usual. Vogel (London Medical Gazette, Vol. i. for 1845, p. 6) found the fibres turbid and opaque, especially towards the centre of the lens. He never detected any foreign opaque substance deposited between the fibres.

Wurzer and Lassaigne (Simon's Animal Chemistry, translated by Day, vol ii. p. 420, London, 1846) say, that the lens, in cataract, contains an excess of phosphate of lime. Simon remarks that this may be the cause of the opacity; or that the opacity may be due to the coagulation of the protein-compounds contained in the lens by the presence of a free acid.

[9] Das Auge, p. 68; Wien, 1813.

[10] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xiv. p. 545; Berlin, 1820.

[11] "Saure Weine veranlassen Staarblindheit."—*Soemmerring.*

[12] Reveillé-Parise, Hygiène Oculaire, p. 25; Paris, 1823.

[13] Mémoires de l'Académie Royale de Chirurgie; Tome v. p. 397; Paris, 1787.

[14] Ibid. Tome vi. p. 332.

[15] Philosophical Transactions for 1723; Vol. xlviii. Part i. p. 322; London, 1754.

[16] De l'Operation de la Cataracte, p. 83; Paris, 1812.

[17] Essai sur quelques Points de l'Histoire de la Cataracte; par Théodore Maunoir; pp. 78. 84; Paris, 1833.

[18] On the Statistics of Operations for Cataract, see Jäger, Monthly Journal of Medical Science, September, 1847, p. 198: Dalrymple's Pathology of the Human Eye, Explanation of Pl. xxvii.: Dingé, Archives d'Ophthalmologie; Tome ii. p. 5; Paris, 1854.

SECTION II.—GENERA AND SPECIES OF CATARACT.

The most important classification of cataracts is that which arranges them into true and spurious; the *true* having their seat *in* or *within* the crystalline capsule, and the *spurious without.* The distinction of the genera and species, admitted under each of these classes, is founded either upon the particular part affected, or particular substance forming the impediment to vision.

True cataract frequently exists without any complication; spurious cataract is always combined with other morbid changes in the eye.

CLASS I.—TRUE CATARACTS.

GENUS I.—LENTICULAR CATARACT.

Fig. Wardrop, Pl. XI. *fig.* 3. Pl. XII. *fig.* 3. Beer, Band II. Taf. III. *fig.* 1. Ammon, Thl. I. Taf. IX. *figs.* 12—15. Taf. X. *figs.* 5, 6. Taf. XI. *figs.* 11—14, 16—27, 40—46. Dalrymple, Pl. XXV. Pl. XXVI. Pl. XXVII. *figs.* 1, 2, 3. Sichel, Pl. XIV. Pl. XV. *figs.* 5, 6. Pl. XVII. 1, 2, 5. Pl. XVIII. *fig.* 4.

Opacity affecting only the lens is the most frequent kind of cataract. Its colour and consistence vary according to the period of life at which it occurs. In old persons, in whom it is most common, the opacity is generally of a pretty dark ash colour, tending sometimes to yellowish or amber; in younger subjects, it is often of the hue of half-boiled white of egg; in children, still lighter, and approaching more to the colour of milk diluted with water.

In young persons, in whom the lens is soft, its whole substance often appears cataractous; in the old, in whom the lens is hard, generally only the surface, and chiefly the anterior surface, is affected with cataract, the rest being of a turbid amber colour. In middle-aged subjects, the external half of the cataractous lens is not unfrequently whitish, and so soft that it mixes with the aqueous humour, when acted on by the needle, while the central half is hard and amber coloured.

The opacity, viewed in the eye, generally appears uniform in colour, and presents itself equally behind the whole field of the pupil. Sometimes it has a pearly shining appearance; occasionally it is marked by radii, stretching from its centre towards its circumference, the lens already tending to break into such divisions as we see it fall into when left to putrefy or to undergo desiccation. Such a lens, even in an old person, is apt to break into fragments, under the needle. It is not an uncommon appearance to see opaque striæ, stretching from the circumference of the lens a short way into its substance. Mr. Dixon[1] considers the ordinary formation of cataract in elderly persons to be in striæ, proceeding from the circumference of the lens towards the poles. If such striæ run upon the back of the lens, they seem to be situated in the vitreous humour; but this is an optical illusion. One variety may be called *cortical,* the edge of the lens being fringed with dense opaque spots, whence striæ proceed over the anterior and posterior surfaces, while the nucleus is more or less transparent. The anterior surface of the opaque lens appears plain, or slightly convex, and at a sufficient distance behind the pupil, to permit a shadow to be cast on it by the iris.

A lenticular cataract, after it is extracted from the eye, always appears less white and more of an amber colour, than it did while in the eye. Some are of a mahogany colour, and extremely hard. I have seen a few cases of lenticular cataract, in which the opacity was so very dark, that, without close examination, the disease might have passed without detection. On concentrating the light on the pupil, the opacity appeared striated. Such cases have been called *black cataracts.*[2] I have not seen the lens after it was extracted, in any of those cases.

Lenticular cataract has rarely any influence on the motions of the pupil, being scarcely ever so large as to obliterate the posterior chamber and press against the iris. I have met with cases of cataract, in which the pupil was fixed, although the retina was sound. The pupil dilated, however, under belladonna. The eyeball is in general healthy, except in old people, in whom opacity of the lens is often accompanied by a fluid state of the vitreous humour. The patient is never totally deprived of sight by lenticular cataract. In by far the greater number of cases, he continues to distinguish, not only light and shade, but even bright colours; and in the twilight, when the pupil expands, he often discovers the forms of large objects. On entering a bright light, he sees none; and in some rare cases, the opacity is so dense to the very circumference of the lens, that even light and shade are distinguished with difficulty.

Lenticular cataract is the most favourable for operation, and a pure case of it, with a lively pupil, and an ordinarily prominent eye, ought always to be selected by the young operator, for his first extraction.

GENUS II.—CAPSULAR CATARACT.

Syn.—Cataracta membranacea.

Species 1. *Anterior Capsular Cataract.*

Fig. Wardrop, Pl. XI. *fig.* 4. Pl. XII. *fig.* 1. Beer, Band II. Taf. III. *fig.* 2. Ammon, Thl. I. Taf. IX. *figs.* 6—10. Taf. XI. *figs.* 4, 7, 8. Sichel, Pl. XXIII. *fig.* 6.

The anterior hemisphere of the capsule is much thicker, and more consistent than the posterior; it exactly resembles the lining membrane of the cornea, and like it, possesses an elasticity of texture, by which, when lacerated or freed from its natural connections, it rolls itself together, like a piece of parchment or goldbeater's leaf. It is much more subject to opacity than the posterior hemisphere, and is often partially opaque when the posterior is transparent.[3]

The opacity in anterior capsular cataract is never uniformly diffused like lenticular opacity, but always streaked or spotted; and is generally of a chalky or pearl-white colour. Sometimes there is only one spot; in other cases, there are many. They are very irregular in form and disposition; some of them stretching from the edge of the capsule, others occupying its centre. In some cases, we observe a single pyramidal speck projecting from the centre of the capsule. On operating, I have sometimes found those specks to separate readily from the capsule, on being touched with the needle, and to fall forward through the dilated pupil into the anterior chamber. In most cases, however, the deposition appears to be in the membrane, not on it merely; its texture is thickened and opaque throughout.

The loss of sight may be greater or less than in lenticular cataract, depending partly on the place and extent of the specks, partly on coincident changes in the eye. Not unfrequently so much vision is preserved, that it would be unwarrantable to operate.

As we have reason to believe that anterior capsular cataract is in almost all instances the result of inflammation, we might expect to find it frequently, or always, conjoined with marks of iritis. Yet this is rarely the case. The nutrition of the anterior hemisphere of the capsule is derived chiefly from the ciliary processes, and not from the iris. Anterior capsular cataract often continues for many years, or for life, without leading to lenticular opacity.

Species 2. *Posterior Capsular Cataract.*

Fig. Ammon, Thl. I. Taf. XI. *figs.* 3, 5.

Opacity of the posterior hemisphere of the crystalline capsule is much rarer than that of the anterior. An opaque state of the posterior capsule is much more apt than a similar condition of the anterior, to superinduce opacity of the lens. When it does so, the ultimate changes of the posterior hemisphere of the capsule, are of course hid from our view. In an instance which came under my observation, posterior capsular cataract occurred suddenly in both eyes, in consequence of stoppage of the menses from cold, and was speedily followed by lenticular opacity.

The opacity, in posterior capsular cataract, is never uniformly diffused, but always exhibits the form of radiating lines, proceeding from the centre of the affected membrane. The ground upon which these opaque lines are placed, is evidently concave, while the lines themselves, being seen through the crystalline, have a watery dull aspect, which forms a striking contrast to the sharp chalky whiteness of the specks in anterior capsular cataract. Occasionally both hemispheres of the capsule are the seat of partial opacity, the lens remaining transparent. I have known this state continue in both eyes for more than eight years, without producing lenticular opacity. Both hemispheres were streaked with opaque lines. When the pupils were in their natural state, the patient saw very little, but during all the period above mentioned she was in the use of a vinous solution of belladonna, which she generally dropped every morning upon the eyes. This remedy never appeared to lose its effect, and the patient fully appreciated its value.

Posterior capsular cataract has no influence on the pupil; but I have once or twice observed it, combined with amaurosis, and in these cases the iris was inactive. I have repeatedly met with it without any complication whatever.

Vision is impaired by this cataract in very various degrees, the patient being able, in some cases, to read with the aid of a magnifying glass; while in other instances, he is almost deprived of sight.

GENUS III.—MORGAGNIAN CATARACT.

Syn.—Cataracta lactea. Cataracta puriformis. Cataracta fluido-dura.

Fig. Beer, Band II. Taf. III. *fig.* 3. Sichel, Pl. XVII. *figs.* 3, 4, 6.

The deposition of an opaque fluid between the lens and its capsule, arising from a disintegration of the intra-capsular cells, or of the superficial laminæ of the lens, constitutes the incipient stage of Morgagnian cataract. In the advanced stage, a considerable portion of the exterior laminæ of the lens is reduced to a fluid state, and not unfrequently capsular opacity is added, so that the disease becomes capsulo-lenticular.

So long as it consists in a mere layer of deposition between the capsule and lens, the cataract presents a cloudy appearance, as if formed of milk and water imperfectly mixed. It is stated, that if the eyeball in this state is repeatedly rubbed with the finger, through the medium of the eyelid, the clouds of opacity change their outline and position; and sometimes they do so, merely on quick motion of the eye from side to side.

The capsule is sometimes distended in cases of Morgagnian cataract, and, pressing against the iris, obliterates the posterior chamber, and impedes the motions of the pupil.

When the disease is incipient, vision is sometimes but slightly impaired, only small objects escaping the observation of the patient, and this especially after the eye has been rubbed or moved; but in the advanced stage, when a great portion of the lens is dissolved, the sight is limited to the perception of light and shade.

Beer observes, that this disease is sudden in its accession. The only cause he had known to operate apparently in its production, was exposure of the eyes to the evaporation of mineral acids, during the oxidation of metals. The only instance of the disease, in the incipient stage, which I have seen, was in a lady, who embarked at Liverpool with her sight perfect, was very sick during her passage to Greenock, and next day landed there with a cataract in one of her eyes, such as I have not observed in any other case, and which corresponded to the description of commencing Morgagnian cataract, except that I could see no change in the form of the opacity upon rubbing the eye.

Incipient Morgagnian cataract is not to be touched in the way of operation; and may perhaps be curable by antiphlogistic means, if attended to sufficiently early.

Morgagnian cataract, in the advanced stage, is known by the name of *cataracta fluido-dura*, and from the appearance of the fluid which escapes from it when the capsule is penetrated by the needle, is also called *milky* or *puriform cataract.* Its most remarkable character is the difference of colour which it presents, according as the patient is in the erect or in the horizontal posture. In the former, the cataract presents a pretty dark brownish colour, owing to the kernel of the lens gravitating forwards towards the pupil; but the instant the patient lies down, the cataract assumes a white colour, the kernel falling back towards the vitreous humour. The disintegration of the lens may proceed to such an extent, that only a small nucleus of it remains, commonly of a dark amber hue. On puncturing the capsule in the operation of division or in that of displacement, the fluid part of the cataract escapes, and mixes immediately with the aqueous humour.

Severe vomiting and inflammation are apt to follow any operation performed on such a cataract.[4]

GENUS IV. — CAPSULO-LENTICULAR CATARACT.

This is a union of the first two genera, or even of the three kinds of cataract, already described. Not only is the opacity of the capsule various in degree and extent, but even in more essential circumstances are the different cases of capsulo-lenticular cataract so unlike, that it is necessary to distinguish several species of this genus. The circumstances in question influence the choice and manner of operation. The opacity of the capsule is frequently on the external surface of the membrane, so that it separates from it, in the form of a thin scale, when touched with the needle.

Species 1. *Central Capsulo-lenticular Cataract.*

Fig. Wardrop, Pl. XII. *figs.* 4, 6. Ammon, Thl. I. Taf. IX. *figs.* 1—5. Taf. XI. *fig.* 10. Thl. III. Taf. XIV. *fig.* 18. Dalrymple, Pl. XXVI. *fig.* 3.

This species presents in general a very limited white point in the centre of the lens and anterior capsule, which is apt to remain unchanged through life. We meet with it not unfrequently in children, whom it appears to render myopic, and so deficient in sight that they cannot learn to read. In some instances the lenticular opacity is considerably broader than the capsular, and not so opaque.

This disease is perhaps in some instances congenital. It frequently follows ophthalmia neonatorum. (See p. 469.) In one case which fell under my observation, it was not observed till after scarlet fever, and was supposed to have originated in that complaint.

When very small, so that, when belladonna is used, the patient sees perhaps to read, it is not to be interfered with.[5]

Species 2. *Common Capsulo-lenticular Cataract.*

Fig. Saunders, Pl. IV. *figs.* 5, 3, 4, 6. Pl. VII. *fig.* 1. Ammon, Thl. I. Taf. IX. *figs.* 16—19, 23, 24. Taf. X. *figs.* 1, 3, 7, 9. Dalrymple, Pl. XXVI. *figs.* 4, 5. Pl. XXVII. *fig.* 5. Pl. XXVIII. *fig.* 4. Sichel, Pl. XVIII. *figs.* 2, 5. Pl. XXIV.

Common capsulo-lenticular cataract may originate in the capsule, in the lens, or in a Morgagnian effusion. Injury of the capsule and lens gives rise to this kind of cataract. A frequent cause is probably an insidious inflammation of the capsule. The opacity often affects the lens for a considerable time, before the capsule is involved.

Part only, or the whole, of one or other, or of both hemispheres of the capsule, may be opaque. The lens also may be partially or wholly opaque. The opacity is partly pearly, as in anterior capsular cataract; partly milky or cloudy, as in the Morgagnian. The lens is sometimes as dark as mahogany. The specks of the capsule have innumerable forms, and on these were founded the old distinctions of *cataracta marmoracea, fenestrata, stellata, punctata, dimidiata, &c.*

In some cases, the opacity of the lens and capsule is so partial, that on dilating the pupil by belladonna, the patient's vision is considerably improved. We should consider well what the eye is to lose, in such a case, by an operation, as well as what it may gain, before touching it. The operation will probably clear away the opaque substance which occupies the centre of the pupil, and thus do good; but it will destroy the transparent portion of the crystalline, and thus the patient may, unless aided by a glass, see worse than he did before the operation.

The lens presents various degrees of consistence in capsulo-lenticular cataract; being sometimes hard, in other cases partially or completely converted into an opaque fluid. In the latter state, the capsule is sometimes so much distended, that the posterior chamber is obliterated, and the iris prevented from moving with facility. Belladonna slowly dilates the pupil, which still more slowly returns to its former size. It is sometimes the case, that even the anterior chamber is diminished by the pressure of the distended capsule, and the consequent advancement of the iris.

Sensibility to light is occasionally very feeble in capsulo-lenticular cataract, owing, in some cases, to the density of the opacity, but more frequently to the presence of amaurosis. Cataract supervening to amaurosis, and especially to traumatic amaurosis, is often capsulo-lenticular. The cataract is slow in its progress, under such circumstances: at length the vitreous humour dissolves, and the iris and the cataract become tremulous. Often, indeed, in capsulo-lenticular cataract, the retina is unsound, and the vitreous humour fluid, although the disease has not been preceded by amaurosis. In most cases, then, of this kind of cataract, the prognosis is unfavourable; the result of operating will generally disappoint both patient and surgeon.

In some cases of advanced capsulo-lenticular cataract, the lens having dissolved, it is observed, when the pupil is dilated by belladonna, that if the patient remains perfectly at rest, and in the sitting position, for a quarter of an hour, the whiter and thicker part of the dissolved lens falls to the bottom of the cavity of the capsule, and the anterior hemisphere of the capsule not being altogether opaque, but merely speckled, vision becomes clearer, from the light being better transmitted through the upper half of the cataract; but on motion of the eye, the contents of the capsule are again mingled together, and the vision becomes as obscure as before.

A still more remarkable improvement in vision occasionally takes place, in such cases, after simply puncturing the capsule with the cataract-needle, so as to allow the opaque fluid contained within it to escape. The fluid is speedily absorbed, and the light, transmitted through the transparent portions of the *cataracta fenestrata* which remains, is sometimes sufficient for a considerable share of vision.

Congenital cataract is oftenest met with in the capsulo-lenticular state. I believe it to be generally lenticular at birth, and only after some months to become capsulo-lenticular.

In congenital cases, the eyes are apt to be affected with perpetual oscillation; and the cornea and iris are not unfrequently smaller than natural, showing an impeded development in other textures besides the lens.

Species 3. *Siliculose Capsulo-lenticular Cataract.*

Fig. Beer, Band II. Taf. III. *fig.* 4. Saunders, Pl. IV. *fig.* 1. Ammon, Thl. I. Taf. XII. *figs.* 3—11.

Siliculose capsulo-lenticular cataract is met with in adults, but oftener in children, constituting in the latter, one of the varieties of the congenital disease. In both, the chief characteristics are interrupted nutrition, and even diminution or entire absorption of the lens, with a shrivelled capsule. In the adult, a mere scale of lens remains, which is hence compared to a shrunk seed surrounded by a large withered pouch. In the young subject, the lens is not unfrequently completely absorbed, so that, by the age of 18 or 20 years, the two hemispheres of the capsule are in contact, so as to form an opaque, elastic, double membrane.

In adults, siliculose cataract is an occasional result of penetrating wounds of the capsule, through which the aqueous humour having been admitted, the exterior softer parts of the lens are dissolved, and the nucleus left.

Schmidt had observed this kind of cataract only in young persons, who, in childhood, had been affected with convulsions, during which he supposed rupture of the capsule to take place, and thus the aqueous humour to be admitted to the lens. Beer, however, met with it in children scarcely two months old, who had never suffered from convulsions.

I am inclined to believe, that any soft lenticular cataract, left to itself, is apt to degenerate, first of all into capsulo-lenticular, the centre of the anterior hemisphere of the capsule becoming opaque and thickened, or numerous opaque spots forming in the capsule, and that then absorption of the lens may take place, so that merely a thin scale of it shall remain. This was the state in one eye of a lady, whose cataracts I had watched for 18 years. In her other eye, the lens was also reduced in thickness, but there was no capsular opacity. The disease had lasted for 25 years, before she submitted to an operation.

The opacity of a siliculose cataract in children, is generally of a light ash colour, rarely very white. The capsule is evidently corrugated, the cataract of small volume, and at a considerable distance behind the iris. Sometimes the pupil is evidently retracted. In adults, again, this cataract is often very white, especially at any spot where the capsule has suffered from injury; elsewhere, it is dusky, or yellowish. It does not advance in a convex form, but appears flat.

Neither in children, nor in adults, is the iris affected in its motions, unless it is adherent to the capsule from inflammation.

In some congenital cases, the lens and capsule, not having grown in proportion to the rest of the body, but remaining nearly of the size they were at birth, on dilating the pupil, a black zone, formed exteriorly by the ciliary processes, and interiorly by the space between them and the circumference of the capsule, is brought into view, surrounding the cataract. This state constitutes what has been called *cataracta cum zonula.* The zone, if examined while light is thrown upon it by means of a lens, is seen to be striated. The patient whose eyes are in the state of cataracta cum zonula, is often able to count the fingers, to distinguish colours, and sometimes even to read. A medical gentleman in this state, by whom I was consulted, reads, writes, and continues to practise as a surgeon. He is myopic, but does not use concave glasses, and sees worse with convex ones.

In siliculose cataract, vision is sometimes completely lost, from the effects of the original cause on the retina; in other cases, distinct sensibility to light is retained, so that an operation may be had recourse to with a reasonable hope of success.

Species 4. *Cystic Capsulo-lenticular Cataract.*

Fig. Ammon, Thl. I. Taf. X. *fig.* 4.

Cystic cataract is generally the result of a blow on the eye or edge of the orbit, sufficiently violent to separate, by its concussion, the lens enclosed in its capsule, from its organic connections. In consequence of such an accident, the vitreous humour is destroyed, the capsule and lens become opaque, and sometimes the lens dissolves.

The opacity is white, and nearly uniform; the opaque body is almost spherical, and presses against the circumference of the pupil. After a time, the cataract, dropping down, lies behind the lower edge of the pupil, and is seen bobbing about on every motion of the head. In this state, the disease is called *cataracta cystica tremulans vel natatilis.* The iris also becomes tremulous. Like a lens bursting through the capsule from a blow, and passing into the anterior chamber, the cystic cataract sometimes rolls forward through the pupil, and resting between the cornea and iris, excites inflammation.

Cystic cataract is always attended by amaurosis, so that if extraction is had recourse to, it is with no hope of restoring vision, but merely to free the patient from the pain which is certain of being excited, if the cataract comes forward into the anterior chamber, and from the danger of sympathetic inflammation attacking the other eye. On extraction, the opaque capsule is sometimes found greatly thickened.

Species 5. *Bursal Capsulo-lenticular Cataract.*

One of the rarest kinds of cataract, consisting in capsulo-lenticular opacity, combined with the presence, within the capsule, of a small cyst filled with purulent matter, is styled *cataractà cum bursa ichorem continente.* The cyst has generally been found behind the lens, but occasionally in front of it.

The opacity is orange; the iris sluggish; the posterior chamber obliterated by the pressure of the over-distended capsule; the perception of light indistinct; the whole habit of the patient weak and cachectic.

Inflammation is the origin of bursal cataract, and probably traumatic inflammation in most cases.

CLASS II.—SPURIOUS CATARACTS.

GENUS I.—FIBRINOUS CATARACT.

Syn.—Cataracta lymphatica.

An effusion of coagulable lymph, in consequence of inflammation of the iris and capsule, constitutes by far the most frequent kind of spurious cataract. It is in almost all cases attended by partial, sometimes by total, opacity of the anterior hemisphere of the capsule (see p. 658.), and occasionally by capsulo-lenticular cataract. The effused lymph is met with in different states, and hence the distinctions which follow.

Species 1. *Flocculent Fibrinous Cataract.*

Fig. Beer, Band II. Taf. III. *fig.* 6.

The opacity visible behind or within the pupil, is in the form of a fine net-work, surrounded by a misshapen, contracted, and partially or completely adherent pupil.

Vision is much impaired, although not always in proportion to the quantity of effused lymph; for sometimes when the pupil is small, and the spurious cataract considerable, a tolerable degree of sight is retained; while in other cases, although the pupil is large, and the net-work of lymph thin, the patient is almost totally blind, the inflammation in which these morbid changes had originated having probably extended to the retina.

Species 2. *Clotted Fibrinous Cataract.*

Fig. Wardrop, Pl. VIII. *fig.* 3.

A clot of lymph, apparently unorganized, occupies the pupil, and sometimes even projects through it, so as to form a *cataracta pyramidata spuria.* The opacity is white; the pupil angular, and motionless; sensibility to light indistinct, or wanting. In most cases, the lymph is adherent to the capsule, which is also opaque and thickened; but occasionally the lymph is unadherent, and the capsule transparent, except within the area of the pupil.

Species 3. *Trabecular Fibrinous Cataract.*

In this variety of spurious cataract, the *cataracte barrée* of the French, the pupil is angular and narrowed, and behind it lies a capsulo-lenticular cataract, in front of which there is a stripe, or bar of lymph, running sometimes in one direction, sometimes in another. This substance is connected at each side with the edge of the pupil, but it does not cease there. Passing behind the iris, it attaches itself to that membrane, or to the ciliary processes. The bar varies in consistence, being sometimes as firm as cartilage, or is even osseous.

The iris is motionless; the perception of light extremely indistinct, or wanting; and the eyeball not unfrequently atrophic.

GENUS II. — PURULENT CATARACT.

A spurious cataract, consisting in purulent matter, is much less frequent than one arising from a lymphatic effusion. In cases of neglected hypopium, the pus is after a time absorbed, and the pupil again brought into view. It sometimes happens, however, that the pupil is occupied by a spurious cataract, of a yellowish colour, which is nothing more than purulent matter, involved in the interstices of a web of fibrin. Vision, under such circumstances, is in general irretrievably lost.

GENUS III. — SANGUINEOUS CATARACT.

Like the last mentioned, this kind of spurious cataract has its basis in a fibrinous effusion, in the interstices of which, minute clots of red blood are observed to lodge, the blood-vessels of the iris or choroid having been ruptured by some previous injury, or during severe inflammation. Reasoning from what was observed in *Case* 624., we might expect sanguineous cataract sometimes to present a black colour. I have seen it retain a red colour for years.

The pupil is not so much contracted in this as in some of the other kinds of spurious cataract, unless hypopium also has been present.

GENUS IV. — PIGMENTOUS CATARACT.

Fig. Ammon, Thl. I. Taf. X. *fig.* 2. Taf. XI. *fig.* 31. Taf. XII. *fig.* 12.

Portions of the pigmentum nigrum from the posterior surface of the iris, adhering to the capsule, constitute what is called pigmentous cataract. In some cases, this spurious cataract is the result of iritis, during the course of which belladonna having been applied, while other remedies were probably neglected, the proper substance of the iris was forced to contract, leaving the uvea bound to the capsule by effused lymph. In other cases, a blow on the eye has the effect of detaching a portion of the pigment from the iris. Falling upon the capsule, it adheres to it, and the capsule afterwards becoming opaque, probably from the same cause which detached the pigmentum nigrum, this substance forms a striking contrast with the white ground upon which it is placed. In either of these sets of cases, the flakes of black pigment present somewhat of a leafy appearance, and hence the name *cataracta arborescens*, which Richter bestowed on this sort of spurious cataract.

The degree of vision is generally very limited, whether injury or iritis has been the cause.

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[1] Lancet, Vol ii. for 1852, pp. 260. 455.

[2] Janin, Mémoires sur l'Œil, pp. 259. 261; Lyon, 1772: Warnatz, Ammon's Zeitschrift für die Ophthalmologie; Vol. iii. p. 295; Dresden, 1832: Scott on Cataract, p. 2; London, 1843: Beauclair, Annales d'Oculistique; Tome xxiii. p. 130; Bruxelles, 1850: Blot, Gazette Médicale de Paris, 26 Juin, 1852, p. 412.

[3] The capability of the capsule to become opaque has been doubted; the opacities reputed capsular being regarded as depositions on the outer or inner surface of the membrane. See Gros, Gazette Médicale de Paris, 24 Avril, 1851; p. 271.

[4] On Morgagnian Cataract, consult Wilde, Medical Times and Gazette, October 2, 1852, p. 327: Dixon, Lancet, February 26, 1853, p. 198.

[5] Consult Bech de Cataracta Centrali; Lipsiæ, 1830.

SECTION III. — VARIOUS ADDITIONAL CLASSIFICATIONS AND DISTINCTIONS OF CATARACT.

Cataracts are often classified, or at least distinguished, according to their consistence, size, colour, duration, and curability. Those who have carefully studied the classification of cataracts founded on the part or parts affected in each genus, can be at little loss in regard to these additional circumstances, which may therefore be dismissed in a few words.

§ 1. *Consistence.*

1. *Hard.* Only a lenticular cataract can be hard, but all lenticular cataracts are not possessed of this property, not even when they occur in persons far advanced in life. Very rarely do we meet with hard cataract in those under forty-five years of age. In an old person, the darker the colour, and the smaller a lenticular cataract is, the harder it will be found. A hard lens is never white; its centre is darker than its circumference, its anterior surface appears flat, and it is never so large as to impede the free motion of the pupil, or prevent a shadow from being thrown on it by the iris.

2. *Tough.* The capsule, or some substance effused into the posterior chamber, may possess the property of toughness. Cystic, siliculose, and trabecular cataracts are of this description. They are all more or less white.

3. *Soft.* Softness is a property which resides in the lens. In subjects about twenty-five, we find lenticular cataract soft and cohesive, so that although the needle passes freely through its substance, the fragments do not readily separate, at least on a first operation. After the aqueous humour is admitted into contact with such a cataract, it becomes more friable. A soft cataract is of a pearl, light ash, or whitish colour. Not unfrequently, the soft lenticular cataract is stellated, from the division of the lens into triangular portions. During extraction, such a cataract is liable to fall into pieces.

4. *Fluid.* The capsule is generally opaque, when it contains a fluid, or dissolved lens. In some cases, the opacity and fluidity of the lens precede the opacity of the capsule; while in other cases, the diseased state of the capsule appears to lead to the disorganization and dissolution of the lens. The latter is probably the fact in ordinary cases of capsulo-lenticular cataract; while in congenital cases, the opacity of the capsule is certainly preceded by that of the lens. Fluid cataract is always white.

5. *Mixed.* The Morgagnian is an example of a mixed cataract; the capsule being tough, the nucleus of the lens hard or soft, according to the age of the patient, and the intervening disintegrated portion of the lens fluid. The bursal cataract, and capsulo-lenticular cataracts in general, are also mixed.

These distinctions, founded on the consistence of cataracts, are important chiefly in reference to the choice of an operation for the cure of this disease.[1]

§ 2. *Size.*

The hard lenticular cataract is small, as is also the siliculose cataract; the soft, fluid, and mixed cataracts are generally large. The size is estimated by the presence or absence of aqueous humour in the posterior chamber, as indicated by the breadth of shadow thrown on the cataract by the iris, or the absence of such shadow.

§ 3. *Colour.*

The opacity of the lens, affected with cataract, is of a bluish-white, light ash, amber, or brown colour, according to the age of the patient, and the nature of the disease. Green cataract is a complication of lenticular cataract with glaucoma. In the *cataracte lenticulaire verte opérable* of M. Sichel, the lens is hard and dichromatic, as in glaucoma, with a slowly increasing turbidness throughout its whole substance, and a slight coagulation of its superficial lamellæ, but without any complication of amaurosis. The bursal cataract is orange. Capsular cataract is always of a pearly or chalky white. Cholesterin cataract presents not merely a white colour, but a shining metallic lustre (see p. 660.), and, when broken down, either spontaneously or by the needle, its particles glance so much, that they have been taken for globules of mercury in the aqueous humour.[2]

§ 4. *Duration and Development.*

In former times, the distinction of ripe and unripe cataracts was considered of great importance. It was supposed that cataract depended on the coagulation of a fluid; and till this process was judged to be sufficiently advanced to permit of the cataract being displaced by the needle, the disease was deemed unripe.[3] If we are still to retain the terms ripe and unripe, we must employ them with a very different meaning. However small or soft a cataract may be, we may call it ripe when it is completely developed, susceptible of no farther progress, or when it deprives the patient of the power of distinguishing objects; whereas, we may call it unripe, when it is not yet fully formed, when there is a suspicion that the opacity may make considerably farther progress, as in posterior capsular, and central cataract, or when the patient still retains so much vision as to see the eyes of a person sitting before him, or distinguish the different articles of furniture in a room. Cases such as these may continue for years unripe for operation.

The distinctions of sudden and slow cataracts, and of those which exist from birth, or supervene at various periods of life, are not undeserving of attention. It must be observed, however, that congenital cataract is not always of the same sort, but may be capsular, lenticular, or capsulo-lenticular; and hence the impropriety of using the phrase *congenital cataract*, as if it were significant of any thing more than the date of the disease.

§ 5. *Curability.*

Pellier[4] introduced a practical or empirical distinction of true, or curable cataracts; mixed, or doubtful; and false, or incurable. The *true*, or *curable*, was to be known by the pupil retaining its power of contracting and dilating in perfection, while the patient was at the same time able to distinguish the light of a candle, or of any other luminous body, and even certain bright colours, such as red, green, &c. The *mixed*, or *doubtful*, was characterized by feeble contraction and dilatation of the pupil, and the patient could scarcely distinguish light from darkness. Along with an opaque state of the lens, this variety was supposed to be attended with disease of the retina, or of some other part of the eye. In the *false*, or *incurable* cases, along with an opaque state of the lens, there was, whatever might be the degree of light to which the eyes were exposed, either an immovably dilated or contracted pupil, and the patient unable to distinguish between the most brilliant light and perfect darkness.

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[1] Much more importance is ascribed to the hardness or softness of the lens in cataract, by some authors, than what I have given it in the text. See Hasner's Entwurf einer anatomischen Begründung der Augenkrankheiten, p. 189; Prague, 1847.

[2] Beer's Repertorium, vol. ii. p. 97; Wien, 1799.

[3] "Expectandum igitur est donec jam non fluere, sed duritie quâdam concrevisse videatur."—*Celsus de re Medica;* Lib. vii. Pars ii. Cap. 1. Sect. 2.

[4] Cours d'Opérations sur la Chirurgie des Yeux; Tome i. p. 172; Paris, 1789.

SECTION IV.—COMPLICATIONS OF CATARACT.

Cataract frequently presents itself along with other diseases of the eye, which are either purely local, or of constitutional origin; while in other cases, it is complicated with constitutional diseases, which may or may not have been instrumental in producing the cataract itself, but are very likely to affect the success of any attempted cure by operation. A perfectly uncomplicated case is rarely met with. The following questions must evidently be of the highest importance, in every instance:—Is the organ of vision in a condition to resume its office to any useful extent, were the cataract removed? Is there nothing in the general health likely to frustrate the success of an operation, no local disease in any other organ likely by sympathy to affect the eye and bring on inflammation?

1. As for purely local complications, I may mention those arising from inflammation of the cornea and iris, such as specks of the cornea, adhesion between the iris and cornea, or between the iris and the capsule. Such complications will readily be recognised, and will influence us in the choice of an operation, and in the mode of executing the particular operation we select. Ophthalmia tarsi, or chronic catarrhal ophthalmia, debars an operation, and especially extraction. Trichiasis or distichiasis, and inversion or eversion of the lids, must also be remedied, before any operation be attempted for the cure of cataract. Local complications often point to a state of constitution unfavourable for any operation, especially for extraction. A speck on the cornea, for example, the result of scrofulous ophthalmia, existing either in the eye which is to be operated on, or in the opposite eye, reduces the probability of success.

2. Some other local complications cannot easily, if at all, be discovered, except at the moment of operation; such as preternatural adhesion between the capsule and the lens, sufficient to prevent extraction from being accomplished, unless with much difficulty, or a dissolved state of the vitreous humour, a complication scarcely less perplexing. The latter is a frequent attendant on glaucoma, and if

the patient is known to have been glaucomatous before becoming the subject of cataract, we must be on our guard against a fluid vitreous humour; but in many instances nothing is known regarding the previous state of the eye, and there is no very manifest sign to lead us to a knowledge of the fact. Abnormal hardness of the eye, however, or a greenish tinge in the cataract, should lead us to suspect a dissolved vitreous humour.

3. Such complications as the following are very unfavourable, yet not sufficiently so as absolutely to forbid an operation; myosis, tremulous iris, varicosity of the external vessels, slight attenuation of the sclerotica, slight bogginess, preternatural firmness of the eyeball. In all of these cases, we may suspect, along with other morbid changes in the interior of the eye, an imperfect sensibility of the retina, and that although the patient may recover a certain share of vision by the removal of the cataract, the improvement will be small and temporary.

4. When myopia forms the complication, the opaque lens appears as if seated further behind the pupil, and the posterior chamber to be more capacious than common. The patient retains a share of useful vision longer, and the cataract is slower of coming to such a pitch as to demand operative interference. I have known a patient remain in this stationary position for many months, still able to distinguish one person from another, and to write his name, and if the characters were black and broad, to read it.

5. If the pupil is dilated and fixed, and the patient unable to distinguish day from night, there can be no doubt that such a degree of amaurosis is present, as renders it needless to think of an operation. But we would not willingly operate, even in cases where a much less degree of amaurosis was present, were we aware of the fact. The mere perception of the hand passing between the light and the eye, is by no means a sufficient index that the retina is free from disease. The amaurosis, indeed, must be incomplete if so much sensibility is retained; but if from the history of the case, and the appearances of the eye, there is reason to dread that the retina retains merely the power of distinguishing light and shade, as it often does in incomplete amaurosis, it would be much better to let the patient alone, than to be raising in his mind false hopes of restoration to sight, subjecting him to the anxieties attendant on an operation, and exposing him to the troubles which are liable to follow, and which are sometimes severe and long-continued. For instance, if a patient, far advanced in life, discerns merely light and shade, and does not possess the natural degree of control over the muscles of the eyes, so that on being desired to look in any particular direction, he gazes in that direction with a movement of the whole head, but without any movement of the eyes, it is almost useless to operate.

6. I have sometimes operated for cataract on an eye affected with strabismus, but even when I have done this in children, in expectation that the accession of vision consequent to the removal of the cataract would assist in curing the squint, I have been disappointed. (See pp. 349, 362, 379.) When cataract is combined with strabismus, the latter, I think, should be cured by operation, before the former

is interfered with. The opposite plan, however, was followed successfully by Dr. Franz, in a congenital case.[1]

7. Glaucoma, in any stage, may become complicated with cataract, an opacity more or less of a whitish colour being superinduced on the surface of the lens previously amber-coloured, but appearing greenish by reflected light, as I shall explain more fully in a subsequent chapter.

When fully developed glaucoma becomes combined with cataract, which is sometimes suddenly the case, there is not merely the addition of a whitish opacity spread over the dead sea-green or olive-green hue of the lens; but there are always present other remarkable appearances in the eye, denoting changes in the organization of almost all its tissues. The opaque lens is voluminous, and, in some cases, seems still more so than it really is, being pressed forwards by the superabundant fluid which occupies the place of the vitreous humour. At last, the lens is pushed in some degree through the pupil. The iris, pale and discoloured, is completely motionless. The pupil is irregularly dilated, the iris shrinking chiefly in one or two directions. The edge of the pupil appears rolled back into the posterior chamber. The eyeball feels hard as a pebble, and is covered by varicose vessels. Internal flashes of light are frequently experienced by the patient, who is totally deprived of any power of perceiving light from without. Chronic choroiditis or arthritic iritis, with severe and long-continued headache, is often the precursor of this hopeless condition of the eye. (See pp. 560, 571.)

8. As for general and remote complications of cataract, the variety is endless. Among the most frequent are rheumatism, scrofula, gout, and syphilis, as general complications; and inveterate ulcers on the lower extremities, as a remote one. It is highly important to make ourselves acquainted with the existence of any such complications, and with the complete history of the health of the patient, who consults us on account of cataract. For instance, if an individual affected with cataract, be of an inflammatory tendency, subject, perhaps, to attacks of pneumonia or pleuritis, great care will be required, both before and after an operation, to avoid the causes of plethora and arterial action. It will probably be only by repeated blood-letting, and purging, with an abstemious diet, both before and after removing the cataract, that the eye will escape destructive inflammation.

A person with any serious organic disease, such as diseased heart, is an improper subject for an operation for cataract. The preliminary abstinence, with such depletory treatment as may be required after the operation, is not unlikely to lead to dropsy and irremediable debility.

A healthy eye, except that it is affected with cataract, and a healthy constitution, are favourable in regard to the result of an operation. If the eye and the constitution are sound, the half of the cornea may be incised, for example, and the lens removed, without much risk. Not so, if the eye, or the individual, is unhealthy. In this case, the wound is apt to suppurate, and the eye to perish from inflammation.

Age, in itself, is not an objection to extraction. In healthy old people, there is generally sufficient reparative power for the healing of the wound; but if the progress of life has been attended with serious diseases of the system, so that the general tone is much lowered, the influence of this state may be very unfavourable.

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[1] Philosophical Transactions; Vol. cxxxi. p. 59; London, 1841.

SECTION V.—PALLIATIVE TREATMENT OF CATARACT.

Shading of the eyes, and dilatation of the pupils by a drop of the solution of atropine every second night, constitute the palliative treatment of cataract. Not merely in the incipient stage, but even in the advanced, many patients find their sight so much improved by these simple means, that they defer, for months or years, to submit to any surgical operation. All patients, however, do not derive the same benefit; and some are so dazzled by dilatation of the pupil, that they cannot suffer it. Partial cataracts, whether capsular or capsulo-lenticular, are the cases in which the benefit is most remarkable.

SECTION VI.—MEDICAL TREATMENT OF CATARACT.

Three different modes of curing cataract without operation, have been proposed; viz. the *antiphlogistic*, the *stimulant*, and the *counter-irritant.* It may fairly be questioned, whether such means have ever succeeded in any case of true cataract, in restoring the natural transparency of the parts. Many of the alleged cures have been either instances of mere lymphatic effusions on the surface of the capsule[1], or else cases of ruptured capsule, in which the removal of the opaque lens has been effected by the solvent power of the aqueous humour. On other occasions, it can scarcely be doubted, that no cataractous affection of the lens or its capsule existed, but that glaucoma, with incipient amaurosis, was mistaken for cataract, and submitted to certain modes of treatment, which not unfrequently prove efficacious in restoring, to a certain degree, the sensibility of the retina.

1. Blood-letting and mercury are likely to be attended with good effects, if inflammation is the cause of the opacity of the lens and capsule. The efficacy of these remedies, in incipient spurious cataracts, especially those of the fibrinous kind, is fully ascertained, but in true cataract they are seldom or never tried. Yet in certain cases of this sort they might perhaps prove beneficial; for instance, in the very commencement of Morgagnian cataract, a disease which, according to Beer, results chiefly from external irritation.

2. Mr. Ware, in one of his notes to Wenzel's Treatise on Cataract, acknowledges himself "willing to hope, that means may hereafter be discovered, by which an opaque crystalline may be rendered transparent, without the performance of any operation whatsoever;" adding, that "the remedies which have appeared to him more effec-

tual than others in these cases, have been the application to the eye itself of one or two drops of æther, once or twice in the course of the day; and occasional frictions of the eye, over the lid, with the point of the finger, first moistened with a weak volatile or mercurial liniment."

M. Gondret, to whom I shall have occasion to refer as recommending counter-irritation as a means of curing cataract, makes use also of stimulants to the eye, especially electricity or galvanism, and ammoniacal collyria. Magendie, who has published[2] a paper by M. Gondret, on the subject, regards the observations of this practitioner as illustrative of his own views of the influence of the fifth nerve on the nutrition of the eye. When that nerve is cut across, the nutrition of the eye is interrupted, the cornea becomes opaque, and the humours are transformed into a substance resembling curd. As similar changes are found to arise where the nerve is unable from disease to execute its functions, it is by no means an unwarrantable conjecture, that cataract, which is generally admitted to be, in most instances, an effect of abnormal nutrition, may arise as well from a faulty action of the nerve which controls the nutrition of the eye, as from any disorder directly affecting the source whence the lens draws its nourishment. If this be correct, then it is probable, that by stimulating, or otherwise modifying the action of the fifth nerve, the nutrition of the lens may be influenced; so that if want of nervous influence leads to opacity, excitation may remove the tendency to cataract, or even restore, in some cases, the natural transparency.

3. M. Gondret's paper, on the Treatment of Cataract, just referred to, contains a number of cases not undeserving of attention, although not one of them is a satisfactory instance of true cataract, cured by the means which he recommends. Sincipital cauterization, by means either of the actual cautery, or of an ointment formed with a highly concentrated solution of ammonia, is the remedy upon which he chiefly depends. I am not prepared altogether to deny the efficacy of powerful counter-irritation, in changing the diseased action upon which the production of true cataract depends; but in most of M. Gondret's cases, especially in those in which the opacity, visible behind the pupil, was preceded by inflammation, the suspicion is strong that the disease was spurious.

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[1] Benvenuto Cellini tells Clement VII., that two cataracts had fallen upon his eyes. These appear to have been the effects of syphilitic iritis, of which Benvenuto cured himself by lignum vitæ.—*Memoirs of Benvenuto Cellini*; Vol. i. chap. 11.

[2] Journal de Physiologie; Tome v. p. 41; Paris, 1825.

SECTION VII.—PRELIMINARY QUESTIONS REGARDING THE REMOVAL OF CATARACT BY OPERATION.

Before entering on the methods of operating for cataract, there are some questions of a general nature, which require to be considered.

1. When only one eye is affected, ought we to proceed to operate, or wait till the other also is attacked? Some tell us, that we ought not to operate under such circumstances, on account of the difference

in visual power which would exist between the two eyes, even were the cataract successfully removed; a difference which, to a certain degree, could no doubt be remedied by the use of a double-convex lens, placed before the eye whence the cataract had been removed, but which, without this assistance, might render the patient's vision so confused, that to see well with either eye, the other would require to be shut. To delay, then, is the practice generally followed in such circumstances. But others recommend an immediate operation, asserting, that by removing the cataract from the one eye, the disease may be prevented from attacking the other; or that, if already commencing in this eye, it might be cured by external and internal remedies, if once the completely cataractous eye were restored to its office by an operation. The sympathy which exists between the eyes is undoubtedly strong, and we can easily conceive that it may operate in inducing similar affections of the crystalline lenses, as it often appears to do in producing similar diseases of the retinæ, and still less equivocally similar ophthalmiæ. Were it established that cataract was thus produced sympathetically, there could be no doubt of the propriety of removing a single cataract, even when not the slightest appearance of the disease could be detected in the opposite eye; but the fact is not established. Cataract in old people generally attacks both eyes within the period of a few months; but in middle life, we often meet with it in one eye, the other having continued unaffected for many years.

2. When both eyes are cataractous, and equally affected, ought both to be operated on at the same time? To this question, my experience leads me to answer in the affirmative, if division of the cataract is the operation to be performed; but if we mean to extract, I regard it as better to operate on one eye only, and wait the result, before touching the other. Double extraction decidedly exposes the eyes to greater risk of inflammation. If we operate only on one eye, and allow it to recover, we may possibly observe, in the course of the operation and recovery, some particulars which will be essentially useful to us in conducting the second operation, or will even lead us to select a different and more suitable mode of operating for the second eye. The patient, however, who has recovered from a first operation, either well, or indifferently, or ill, is often unwilling to submit to a second.

The confinement, abstinence, and depletion, used after a first operation, sometimes cause the eye not operated on, to fall so much back in the orbit, that it is difficult to perform extraction on it.

3. Does the patient require to undergo any particular course of preparation, before submitting to an operation for cataract? The time was, when a long and severe preparation was deemed necessary, consisting of venesection, cupping and scarifying, purging, and low diet. Now-a-days, we have perhaps fallen into an opposite error, and avail ourselves too little of the precautions fitted to prevent inflammation. As it is of the highest importance that recovery should take place without inflammatory action, it may not be improper to bleed the patient once before operating, both to moderate the impetus of the circulation, and to discover by the appearances of the blood,

whether there may not be inflammation already present in the system. Should the blood prove sizy, it would be highly imprudent to proceed immediately to an operation. It is better not to operate on pregnant females, as the agitation is apt to cause abortion.

If the bowels be disordered, with foul tongue, deficient appetite, and headache, a dose of calomel every second or third night, followed by salts and senna next morning, ought to be given three or four times, or till the symptoms in question are removed. Even when the patient appears to be in perfect health, a few saline purges ought to be administered at proper intervals, and an antiphlogistic plan of diet followed for at least eight or ten days. Rest is to be observed for several days before any operation. Catarrh, or cough, debars an operation, especially extraction.

Immediately before any operation, the patient must take no full meal, and carefully avoid all articles difficult of digestion.

When once an operation is resolved upon, it ought not to be put off, without some good cause; for the patient's anxiety grows with every hour, and he is apt greatly to magnify the dangers to be apprehended. It proves highly encouraging to the patient, to talk with one who has been successfully operated on, and who is able to give a reasonable account of the operation.

4. Is there any particular season of the year more suited than another for operating?[1] The spring was formerly selected in preference to any other season. Yet from the prevalence of catarrhal, rheumatic, and inflammatory affections at that period of the year, it is perhaps the worst. Patients who are liable to suffer from such complaints, ought to be operated on in dry summer weather only; but a purely local cataract, occurring in an individual otherwise healthy, may be removed at any season, provided the patient is properly sheltered and cared for.

5. In cases of congenital cataract, ought the operation to be delayed till the patient has attained an age sufficient to enable him to understand the importance of an attempt to restore sight, or ought it to be practised during infancy? The answer decidedly is, Operate in infancy, and, if possible, before teething commences. If the operation is delayed, the capsule becomes opaque and tough, and therefore much more difficult to remove, while the eyes, having no distinct perception of external objects, acquire such an inveterate habit of rolling, that for a long time after the pupil has been cleared by an operation, no voluntary effort can control this irregular motion.[2] Speaking of the results of Mr. Saunders' operations, Dr. Farre states, that the sensibility of the eye, "in many of the cases cured at the ages of four years and under, could not be surpassed in children who had enjoyed vision from birth; but at eight years or even earlier, the sense was evidently less active; at 12, it was still more dull; and from the age of 15 and upwards, it was generally very imperfect, and sometimes the mere perception of light remained."[3]

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[1] Consult Hamilton, London and Edinburgh Monthly Journal of Medical Science, March, 1843, p. 201.

[2] The motion referred to does not, in every case, appear the result of the eyes being affected with cataract; but is often a

coincident disease, namely oscillation, and is then not likely to subside, even after the cataract is removed.

[8] Saunders' Treatise on some Practical Points relating to the Diseases of the Eye, p. 154; London, 1811.

SECTION VIII.—POSITION OF THE PATIENT DURING OPERATIONS FOR CATARACT—MODES OF FIXING THE EYE—USE OF CHLOROFORM.

In operations on the eye, much depends on the position of the patient, assistant, and operator, and on each understanding what he is to do. An ignorant forwardness on the part of the assistant, or a want of composure in the patient, may in an instant defeat the most perfect dexterity of the operator.

A day or two before the operation, the surgeon should examine the capability of the patient to allow his eyelids to be held asunder and pressed on by the fingers, as they must be at the operation. Some bear this easily; others fret at it. The latter cannot readily turn their eye into the position wanted by the surgeon, their eye is seized with muscular spasms, and at the moment of completing the section of the cornea, the lens and vitreous humour are apt to bolt out together. The impatience of pressure may be such as to deter the surgeon from extracting.

A clear and steady light is to be chosen, entering the apartment by the window near to which the patient is placed, and by no other.

Some operators place the patient on a chair, with an assistant standing behind him; some lay him on his back on a table with his head on a pillow, and employ an assistant to take charge of one or other eyelid; others dispense with an assistant.

1. The patient being seated on a low stool, or on a chair without a back, leans his head against the breast of the assistant, who stands behind him. We shall suppose that the left eye is to be operated on. In this case, the patient is to turn his left side a little towards the window. With his hands he may lay hold of the seat, and he must be cautioned that on no account is he to raise them towards his eyes. If he cannot be depended on for this, an assistant at each side must watch his hands.

To the assistant is committed the double charge of preventing the head from bending suddenly back, and of supporting the upper lid. With his left hand he lays hold of the patient by the chin, while with the extremities of the index, or of the index and middle fingers of his right hand applied upon the border of the upper lid, he raises it as completely as possible, presses it against the edge of the orbit, and thus exposes the upper part of the eyeball. He allows his fingers to project so far beyond the border of the lid, that should the patient turn his eye up, it would come into contact with the fingers, and thus be, as it were, scared back into its proper position. In general, the assistant not merely does not require, but must avoid, to make pressure on the eye, in any stage of the operation.

The operator sits before and close to the patient, on a seat of such height that the patient's head is opposite to the breast of the operator, who, by this means, is able to observe with ease whatever goes on in the eye, and is not obliged to elevate his arms too much during the operation. The operator now tries the point of the needle or knife, by passing it through a bit of very thin leather, held on the stretch. If it produces no sound on piercing the leather, the point is good. Still, supposing that it is the left eye which is to be operated on, he takes the instrument in his right hand, while with the index-finger of his left he draws down the lower lid, and places the point of that finger upon the border of the lid, so as just to touch the eyeball. The middle finger he places on the caruncula lacrymalis, allowing it at the same time to touch the nasal side of the eyeball, so as to steady it, and prevent it from turning, as it is very apt to do, towards the nose; a position which, if assumed after the operation has commenced, may be productive of serious mischief.

By the fingers of the assistant and the operator, placed as has been now explained, the eye is fixed, yet without pressure. To whatever side it turns, it meets with the point of a finger, except towards the temple, where the needle or the knife is about to enter.

Various sorts of specula, spikes, and hooks, have been invented for fixing the eye; but all of them, except the bent silver wire speculum (*fig.* 41. p. 363.), are now discarded. It is occasionally employed, especially in operations on children, for supporting the upper lid, being applied sometimes to its outer surface, but more frequently beneath its edge.

If it is the right eye which is to be operated on, the patient turns his right side a little towards the window, the assistant places his right hand on the chin, and with his left raises the upper eyelid, while the operator takes the needle or knife in his left hand.

2. Some operators prefer, in all cases, that the patient be laid along upon a table; alleging that the head is thereby kept more steady, and that this position is found greatly more convenient, if the patient should grow faint during the operation. When the horizontal position is adopted and the operator is ambidextrous, he sits or stands at the end of the table and behind the head of the patient, supporting the right upper eyelid with the forefinger of the left hand, placing the middle finger on the caruncula lacrymalis, and holding the instrument in his right hand, while the assistant, standing by the patient's side, depresses the lower lid. When the left eye is to be operated on, the surgeon takes the instrument in his left hand, and raises the upper eyelid with his right. The patient should be so placed that the eye to be operated on is next the window. If the operator prefers operating with his right hand on the left eye, he stands by the patient's left side, and depresses the lower eyelid with his left hand, while the assistant sitting or standing behind the patient raises the upper lid.

3. Some operators employ no assistant. The patient being seated on a low chair, the back of which is furnished with a hollow cushion upon which to rest the head, which is bent a good deal back, the surgeon stands behind him. With the index and middle-finger of the hand which does not hold the knife, placed upon the upper and lower eyelids towards their nasal extremity, he presses them against the upper and lower edge of the orbit, keeps them open, and fixes the eye.

If not ambidextrous, he operates thus only on the right eye; when he operates on the left eye, he stands by the patient's left side, and separates the lids by means of the index-finger and thumb of the left hand. I understand that a distinguished operator in London, who uses no assistant, still stands behind the patient, even when the left eye is to be operated on, and makes the section with the right hand, while with the fingers of the left he supports the lids.

The same method of fixing the lids may be adopted with the patient laid on a table. It is only for those who are experienced and dextrous, to attempt operating without an assistant, and even with them the practice does not always answer.[1] If the fingers of the hand which does not hold the knife be occupied in keeping the eyelids asunder, it may be impossible for the unaided operator to prevent the turning of the eye towards the nose.

If with the eye which is not to be operated on, the patient retains any considerable degree of vision, I generally cover it with a monoculus, or tie it up, that both eyes may be more at rest during the operation. There is no better mode, however, of fixing the eyes than by desiring the patient to look at the operator, who seizes that moment for entering the instrument into the eye, which is the subject of the operation. Of this advantage we are not so certain, if the other eye is excluded from the light.

It is of very great advantage in operating on children, to put them fully under the influence of chloroform. If this is not done, the child must be wrapt up in a shawl pinned so as to keep the legs and arms at rest. Care must be taken not to allow the lids of the child to become everted, else the conjunctiva protrudes, when it is often extremely difficult to penetrate it with the needle.

Needle operations may be performed on timid adults also, under the influence of chloroform. In extraction I have not ventured to use it, being afraid lest the vomiting which is apt to follow its anæsthetic effect, might cause rupture of the internal structures of the eye. I have received, however, from others who have used it in extraction, a very favourable account of the complete stillness of the eye which it affords. To obviate, if possible, its sickening effect it ought not to be administered till five or six hours have elapsed after taking food. In old subjects in whom there is any suspicion of organic disease in any of the splanchnic cavities, it ought not to be employed.[2]

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[1] See account of an operation by Barth, who used no assistant, in Santerelli, Delle Cateratte, p. 61; Forli, 1811.

[2] See White Cooper, Association Medical Journal, January 7, 1853, p. 6.

SECTION IX. — GENERAL ACCOUNT OF THE OPERATIONS FOR CATARACT.

There are three kinds of operation for the cure of cataract. All three have undergone many modifications, but each is founded on a principle totally differing from that of the others.

1. There is the mere removal of the cataract out of the axis of

vision, leaving it still in the eye. This, formerly called *Couching*, is now termed *Displacement*.

2. We have the complete *Extraction* of the cataract.

3. There is the *Division* of the cataract into fragments, which being dissolved in the aqueous humour, disappear by absorption.

Although it be possible to perform any of the three kinds of operation, either through the cornea or through the sclerotica, displacement is best effected through the sclerotica, and extraction through the cornea, while the advantages of the anterior and posterior operations of division are about equal.

The instruments invented for the performance of the operations for cataract are very various, almost every operator, and in many instances those who have operated little or none, having modified the old, or invented new ones. The simpler and the fewer the instruments are, the better. If the young oculist attach himself to the simplest modes of operating, and acquire dexterity and skill in their performance, he will think little of the complicated contrivances with which some have tried to make up for their want of knowledge and their deficiency in mechanical adroitness.

I. In *Displacement*, of which there are two varieties, viz. *Depression* and *Reclination*, we assign a new situation to the cataract, at the expense of the vitreous humour, which we know to be by no means a mere gelatinous mass, but an organized part intimately connected with those structures of the eye, which are of the highest importance and the most susceptible of reaction. We conclude, then, that to extensively lacerate the hyaloid membrane, as must be done in tearing away and forcing down into the vitreous humour such a body as the lens, is likely to produce serious injury to the internal textures of the eye, excite inflammation of the ciliary body and iris, disorganize the vitreous humour, and lead, directly or indirectly, to insensibility of the retina. The displaced lens, also, is apt to come into contact with the ciliary processes, and to excite iritis, followed by closure of the pupil; or to press against the retina, which must necessarily cause amaurosis. These effects may follow more or less quickly. If the displaced lens is firm and entire, or inclosed within the capsule, it will not dissolve in the vitreous humour, but contracting adhesions to the neighbouring parts, will remain as a permanent cause of irritation and chronic inflammation.

In *Depression*, the lens is pushed, as far as this can be done, directly below the level of the pupil. It will follow, of course, the curvature of the eye, sweeping over the corpus ciliare towards the anterior edge of the retina, and resting in such a position, that its anterior surface shall still be directed forwards, and somewhat downwards. (*Fig.* 73.) If the lens is hard, and the depression rudely performed, the retina, and even the choroid, may readily be lacerated in the operation, and the eye deprived in an instant of all chance of recovering the power of sight. If the lens is left resting upon the retina, it is reasonable to conclude, that this of itself will prevent vision. Should it become loosened from its new situation, and rise

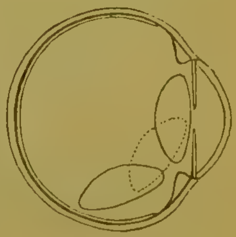

Fig. 73.

a little from the retina, the sensibility of this membrane may perhaps return; but in other cases, even after the pressure is thus removed, the amaurosis may continue.

After depression, the lens is very partially covered by vitreous humour, by the elasticity of which, if this part be healthy, it is apt to be pushed up, and thus to resume its original situation, forming as at first an impediment to vision, and again requiring to be displaced. If the vitreous humour is dissolved, the lens will gravitate to the bottom of the eye.

Re-ascension of the cataract is not so apt to occur after *Reclination.* In this operation, the lens is made to turn over towards the bottom of the vitreous humour, in such a way that the surface of the lens, which formerly was directed forwards, now looks upwards, and what was the upper edge is turned backwards. (*Fig.* 74.) Over the lens, displaced in this manner, the vitreous humour closes more completely than over the depressed lens, so that re-ascension is less likely to happen.

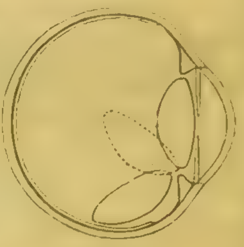

Fig. 74.

Another advantage of reclination is, that the retina is not so liable to be pressed on by the cataract as after depression, the displacement effected by the former operation carrying the lens completely below the level of the pupil, leaving it there in the vitreous humour, but not pressing it into contact with the floor of the eyeball.

On the other hand, reclination must necessarily break through and destroy the hyaloid membrane more extensively than depression; while after the former, as after the latter operation the cataract will certainly often remain, like a foreign body, the cause of continued irritation within the eye, and of ultimate insensibility to light.

II. *Extraction* is a removal of the cataract out of the eye at once; and if easy of performance and not very dangerous for the eye, we would without hesitation pronounce it the operation which ought to be preferred. But to perform this operation, whether through the cornea or sclerotica, requires no small degree of dexterity, and is attended by very considerable danger to the eye.

If the cornea is the part to be opened for the extraction of the cataract, the incision, in order that it may unite without inflammation, and without any cicatrice which would prevent the entrance of light, must be an exact segment of a circle, regular and smooth, at a fixed distance from the sclerotica, and of sufficient size to allow the easy exit of the cataract. Both in making the section of the cornea, which is the first period of the operation, and in the subsequent one of opening the capsule, the iris ought to remain uninjured. One of the chief advantages attending a successful extraction, is its leaving the posterior capsule and all behind it untouched; one of the principal dangers attached to the operation is the loss of vitreous humour. The hyaloid membrane, if not perfectly sound, is apt to burst, and the vitreous humour to be ejected from the eye, either before, along with, or after the opaque lens. There remains, after the most favourable extraction, an extensive wound of the cornea, which we are most anxious should close by immediate union, and without any protrusion of the iris. The latter event, one of the most unfortunate which can happen, appears in some cases to be the consequence, and is always an additional cause, of inflammation. Occasionally violent suppurative inflammation attacks the eye after extraction, so that the natural structure of the organ is totally changed. In less severe cases, the iris suffers in texture, the pupil closes, or the cornea is rendered opaque.

To divide circularly with a knife a membrane inclosing a fluid, which fluid is not to be evacuated till the section is carried to the extent of a semicircle, and within which fluid is suspended another and a moveable membrane, which is neither to be allowed to be displaced, nor is in any way to be injured in the execution of the section, is a mechanical problem necessarily difficult. It is too artificial a piece of surgery to be trusted to the hands of those who have not made themselves masters of the subject, and already shown a certain share of natural or acquired dexterity in operating on the eye. It is too nice and dangerous an operation to be undertaken without the utmost precaution, composure, and steadiness.

Nor is it likely that extraction through the sclerotica is less difficult or less dangerous. Indeed, this method appears to be universally abandoned, as exposing the eye to hæmorrhage, to the almost certain loss of a large quantity of vitreous humour, and consequently to destruction of the organ. If the risk is so great, it must deter us from this mode of operating, even while it possesses the advantage of leaving the cornea untouched.

III. *Division* is founded on the fact that the aqueous humour, acting as a menstruum perpetually absorbed and secreted, has the power of completely dissolving and removing the crystalline lens. Reasoning from this fact, and from the anatomy of the parts concerned, we naturally conclude that it will be easy to introduce a needle either through the cornea or through the sclerotica, open up the anterior hemisphere of the capsule, so as to admit the aqueous humour, and thus procure the solution of the cataract. Accordingly, division is regarded as the least dangerous mode of curing cataract by operation. It is not exempt, however, from disadvantages, trifling ones indeed, when compared to the dangers attendant on displacement or extraction. The torn capsule is apt to re-unite, so that the aqueous humour is excluded from the cataract, and the solution ceases. In such a case, the operation must be repeated, the lens itself divided, and the fragments brought into the anterior chamber. Iritis is not an unfrequent consequence of the operation of division, and is apt to be attended by opacity of the capsule from inflammation. This may take place, even when the iritis is slight; and as the capsule is insoluble, there is no way of removing its opaque shreds from behind the pupil, except by displacement or extraction. Rudely performed division, by injuring the vessels which nourish the interior of the eye, induces dissolution of the hyaloid membrane, the effects of which being propagated to the retina bring on amaurosis. If the cataract is hard, although the capsule is divided, the lens will not dissolve for a very long period of time, if at all; and to divide the hard opaque lens of an old person is impracticable; but in subjects about middle life, and still more in young persons and children, the method by division is not merely sufficient for the cure of the disease, but is plainly the operation to be preferred.

The conclusions to be drawn from a general review of the operations for cataract are, that each possesses advantages and disadvantages, and is attended by peculiar dangers; that one mode of operating will be suitable for one case of cataract, and another for another; and that there can be no more incontestible proof of a man's ignorance of the subject than his asking which of the operations we practise, or of a man's being a charlatan than his pretending to cure all kinds of cataract by one kind of operation alone, modified by some trifling change in the manipulations or the instruments. Each of the operations for cataract will, in certain circumstances, recommend itself to our choice; none is to be universally adopted and practised, to the entire rejection of the others.

SECTION X.—DEPRESSION AND RECLINATION.

In *depression*, the cataract is pressed down by the needle below the level of the pupil, somewhat into the vitreous humour, and to such a depth as no longer to form an obstacle to vision. This operation, although by no means the best, is certainly one of the simplest, as it is the most ancient, and therefore claims to be first described.

If we examine the figure of the eye and the proportions of its several parts, it will be evident that there is not sufficient room for the lodgement of a lens of normal size directly below the pupil. If merely depressed (*fig.* 73. p. 773), without being reclined or turned over, the lens will not be sufficiently covered by the vitreous humour, and will be very apt to re-ascend into its original situation. If pressed too much down, it will be lodged upon the ciliary processes and retina, or will be thrust between the retina and the choroid, or even through these membranes[1], causing excessive pain at the moment of the displacement, pain which has in some instances been known to last through life; inducing vomiting some hours after the operation, scarcely to be calmed; and bringing on inflammation and amaurosis. These appear to be the unavoidable effects of incautiously depressing a large lens. They are carefully to be distinguished from other bad effects which are apt to attend this operation, but which with attention may be avoided.

The frequent complaints made against the operation of depression led Willburg[2] to propose that modification of displacement known by the name of *reclination.* In this operation the needle being applied, not to the upper edge but to the anterior surface of the lens, or rather of the capsule, the cataract is pressed backwards and downwards into the lower part of the vitreous humour, opposite to the interval between the external and inferior straight muscles, and is left with its anterior surface directed upwards, its superior edge backwards. (*Fig.* 74. p. 774.) This operation must necessarily be attended with much disturbance of the vitreous humour; yet it is in a great measure free from the principal objections against depression. Even a large cataract which has been reclined, may lie embedded in the vitreous humour, without being in contact with any other part of the eye, and consequently without pressing directly against the retina or the corpus ciliare. It will also be so impacted in the vitreous humour that it will not be likely to re-ascend.

§ 1. *Depression or Reclination through the Cornea.*

In depression and reclination, the needle is generally introduced through the sclerotica and choroid. Some, however, have preferred passing it through the cornea; but in this way neither operation can be satisfactorily performed. As it is impossible, through the cornea, to open the posterior capsule, the displacement can be effected only by forcing the cataract through that membrane; a violent step which may not always succeed. In attempting displacement through the cornea, it is extremely difficult to separate the whole circumference of the cataract from its natural connections, even although the pupil is fully dilated by belladonna. It will, therefore, not be put quite out of sight, and will be very apt to re-ascend. If the operator, observing the operation imperfectly completed, make further attempts to displace the cataract, he will probably bruise and perhaps lacerate the iris. When partial adhesions exist between the iris and capsule, requiring to be separated before proceeding to displacement of the cataract, the separation can with difficulty be effected by the needle passed through the cornea.

§ 2. *Depression or Reclination through the Sclerotica.*

On the evening previous to the operation, extract of belladonna, moistened to the consistence of cream, is to be smeared on the eyebrow and eyelids, and allowed to remain till about half an hour before the operation, when it is to be washed off with a sponge and tepid water. If the pupil is not by this time fully dilated, a solution of atropine, or filtered solution of extract of belladonna in water, is to be dropped upon the conjunctiva, not rudely dashed in with a hair pencil.

The instrument for depression and reclination is a bent needle, of which *fig.* 76. is a lateral view, while *fig.* 77. shows its convex surface. The curved part measures not more than $\frac{1}{3}$ inch in length, nor more than $\frac{1}{20}$ inch in breadth at its broadest part. The neck is round, so that after the instrument is introduced into the eye, it may be turned in any direction, without distorting or enlarging the wound by which it has been passed through the sclerotica and choroid.

Depression and reclination are divided each into four periods, which must not only be distinctly understood by the surgeon, but carefully observed by him in practice. In the *first* period, the needle is introduced through the tunics, and into the vitreous humour. In the *second*, the posterior hemisphere of the capsule is divided. In the *third*, the anterior hemisphere of the capsule is divided. In the *fourth*, the actual displacement is effected. It is only in the fourth period that reclination differs from depression.

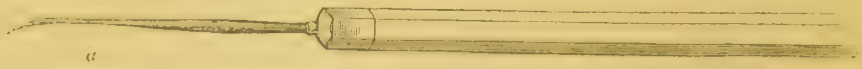

Fig. 75.

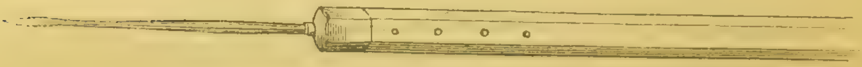

Fig. 76.

1*st Period.* The needle must enter the eye so as to wound nothing but what cannot be avoided, else we may be prevented from satisfactorily executing the remaining parts of the operation, or may inflict serious and irreparable injury.

The parts which must be wounded, are the conjunctiva, sclerotica, choroid, and vitreous humour. The parts to be avoided are the ciliary processes, the retina, the branches of the iridal or long ciliary artery, and the lens. The vessels of the choroid are also to be spared as much as possible. If the ciliary processes, the branches of the iridal artery, or several of the choroidal arteries be wounded, hæmorrhagy is likely to take place into the eye. We are taught to believe that the retina is insensible to mechanical irritation, so that the wounding of it with the needle should not be productive of any pain; but as we know not how far the violent vomiting which not unfrequently follows displacement, may sometimes be owing to touching the retina with the needle, or how far its sensibility to light may afterwards be affected from being wounded, we should always avoid a part of the eye the integrity of which, it is reasonable to conclude, must be of the highest importance. If the needle is directed towards the cataract in the first period, it is apt to enter the substance of the lens, so that on attempting to proceed with the operation, the whole cataract moves towards the pupil; an inconvenient and awkward occurrence, requiring the needle to be withdrawn a little and freed from the lens, before the operation can be proceeded with.

All these errors may be avoided by attending to the following rules: —

1. Taking the needle in his right hand, if it is the left eye which is to be operated on, and *vice versâ,* the operator holds it with the convex surface looking upwards and the concave surface downwards, in order that in passing through the pars non-plicata of the corpus ciliare, it may divide as few of the choroidal arteries as possible.

2. The lids being fixed by the fingers of the assistant and operator, in the manner specified at page 770, the operator leans with his little

finger on the cheek of the patient as on a point of support, in order to prevent the needle from sinking suddenly and to too great a depth into the eye.

3. The point of the instrument is to be directed towards the centre of the vitreous humour, thus completely avoiding the lens.

4. The needle is to be entered at the distance of one-sixth of an inch behind the temporal edge of the cornea. If this rule is not attended to, but the instrument is entered either much nearer to the cornea or much farther from it, the ciliary processes in the one case, and in the other the retina, can scarcely escape being injured.

5. As the iridal artery divides into two branches, at the distance of about three lines from the edge of the cornea, in order to avoid these branches the needle is to be entered in the equator of the eye.

6. As soon as the needle has penetrated to the depth of one-fifth of an inch, or in other words, as soon as the lance-shaped part of it is fairly within the choroid, the first period of the operation is completed.

2nd Period. The second period of the operation commences with a double motion of the needle, by which, in the first place, it is made to perform a quarter of a revolution on its axis, so that its concave surface comes to be turned forwards and its convex surface backwards, while at the same time its handle is carried a little towards the temple, and its point forwards and inwards to the back of the lens. The extent to which it will require to be introduced, in order to reach the centre of the posterior surface of the lens, is, as is shown at *a*, *fig.* 75., about $\frac{7}{20}$ inch, and it is well to mark this length on the needle by gilding the portion of it nearer the handle, so that the operator may know when it is pushed sufficiently into the eye. The point of the needle is now to be raised to the middle of the upper edge of the posterior hemisphere of the capsule, and by a repeated vertical movement of the point, the posterior hemisphere, and especially the lower part of it, is to be divided, so as to prepare an aperture for the passage of the lens. The incision may now be prolonged a little way downwards through the vitreous humour.

3rd Period. As soon as the surgeon considers the division of the posterior hemisphere of the capsule to be accomplished, he brings the needle slowly over the upper edge, or under the lower edge, of the crystalline body, into the posterior chamber. The needle will then appear within the pupil, and in front of the cataract, as is represented in *fig.* 87., p. 817. Having turned the point of the needle towards the anterior hemisphere of the capsule, by alternate elevations and depressions of the point, the surgeon divides that membrane to the extent of its whole diameter.

4th Period. The rest of the operation differs according as the cataract is to be depressed or reclined.

If the operator chooses to depress, he elevates the point of the needle by lowering its handle, till the point reaches the superior edge of the lens. The concave surface of the instrument being applied to the top of the cataract, the handle is now to be gradually elevated, and the point depressed; the cataract descends from behind the pupil; its course is downwards, and a little outwards and backwards; it is to be depressed till it is no longer in sight. If in effecting this the handle is raised much higher than the horizontal position, the cataract is apt to be pressed through the retina, and vision extinguished by the very attempt which is made to restore it.

For the space of a minute or two, the needle is to be kept in contact with the depressed cataract.[3] The needle is then to be rotated between the finger and thumb, so as to free its point from the lens. Its point is then to be slowly raised, the operator taking notice whether the cataract re-ascends, or remains depressed. If it re-ascends, the depression must be repeated.

In this operation, and also in reclination, it might perhaps be deemed desirable that the capsule should be displaced along with the opaque lens; but as this cannot be easily and safely accomplished, we content ourselves with dividing it, leaving its shreds attached, through the medium of the zonula Zinnii, to the ciliary processes. These shreds, being highly elastic, will shrink or roll themselves up, and prove no impediment to vision, unless inflammation come on and render them opaque, in which case they are apt to coalesce, and will form a secondary capsular cataract. The annexed figure (*fig.* 77.) shows the interior of an eye, dissected by Dr. W. Soemmerring[4], eight years and a half after reclination. The lens had entirely disappeared, a portion of the centre of the capsule, which had been displaced along with the lens, appeared curled up and lying on the lower and outer part of the ciliary body, while the remainder of the capsule formed two transparent semilunar flaps, retaining their natural situation, the one behind the upper, and the other behind the lower part of the iris. It is probable that in this case no particular attention had been paid to a division of the capsule, before proceeding to the displacement of the lens.[5]

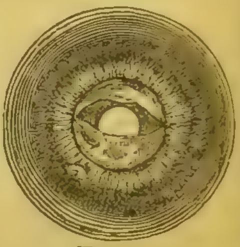
Fig. 77.

After the displacement is accomplished, and just before withdrawing the needle from the eye, it is recommended to turn the point of the instrument towards the cornea, and to move it three or four times round within the pupil, so as to lacerate the capsule, if it had escaped being fully divided in the third period. This may be the means of preventing secondary capsular cataract, and should the lens re-ascend, will insure its being exposed to the dissolving action of the aqueous humour. The needle is then to be removed from the eye, in the same position, as to its surfaces, in which it was introduced.

If the surgeon prefers reclination, he commences the fourth period by raising the point of the needle not more than the tenth of an inch above the transverse diameter of the lens; he presses the concave surface of the needle against the cataract, and then immediately proceeds to recline it, by moving the handle of the instrument upwards and forwards, while its point, of course, passes downwards and backwards. By this manipulation, the cataract is made to fall over into the vitreous humour, and is then pressed downwards, backwards, and a little outwards. The position of the needle at the end of reclination, is very different from its position at the end of depression. In the latter, it is nearly horizontal; in the former, the handle is pointing upwards, outwards, and forwards, nearly in a line with the temple of the operator.

Manner of using the needle.—1. The instrument is to be held very lightly in the hand, so that it may be moved easily in all directions. If it be grasped firmly by the fingers, the operator has comparatively no power over it, and is unable to execute the delicate movements required in the operations of displacement.

2. When once the needle is introduced into the eye, no part of the depression or reclination is to be executed by a motion of the whole instrument in one direction; but the point is always to be moved in one direction, and the handle in another, so that the needle forms a lever of the first kind, the sclerotica being the fulcrum. Upon this fulcrum the instrument ought to be moved with the least degree of pressure possible, and without any dragging of the eye.

Modifications of depression and reclination according to varieties of cataract.—1. When the cataractous lens is found to be friable, and breaks into fragments under the pressure of the needle, or soft, so that the needle passes through it, displacement ought to be altogether, or in a great measure, abandoned, and the operation of division immediately substituted in its room. The anterior hemisphere of the capsule is carefully to be lacerated, and its central part, if possible, destroyed; the fragments of the friable lens will often pass, almost of themselves, through the lacerated opening, and through the pupil into the anterior chamber, where they will speedily be dissolved. If the nucleus of the lens, however, appears to be hard, we have our choice either to displace it, or leave it *in situ*, exposed to the action of the aqueous humour. The pieces into which a soft lens may be divided, are not so easily scattered by the application of the needle; and in such a case, it is better not to attempt too much, but rather confine ourselves to the comminution of the anterior hemisphere of the capsule, reserving for a subsequent operation the division of the lens and dispersion of its fragments. If, instead of abandoning displacement, the surgeon persists in it, when he finds the cataract to be soft, he must not be surprised if internal inflammation of the eye should ensue, in consequence of the swelling which the soft lens is likely to undergo in the vitreous humour.

2. If displacement be attempted in advanced cases of Morgagnian cataracta (*cataracta fluido-dura*), the fluid part of the cataract, the instant that the anterior capsule is opened, is poured into the aqueous humour, so as to render it quite turbid. The operator should now endeavour to displace the hard nucleus; and as the opaque fluid, if left within the eye, is extremely apt to cause vomiting and pain, paracentesis corneæ should immediately be performed, so as to evacuate the contents of the aqueous chambers.

3. A similar escape of the disintegrated lens into the aqueous humour, will happen in many cases of capsulo-lenticular cataract. If

the plan is not followed, of immediately puncturing the cornea and allowing the mixture of aqueous humour and fluid lens to escape, which is the practice to be recommended, in the course of some days the aqueous humour may again resume its natural transparency, the fluid lenticular matter having been absorbed; but unless something more has been done at the time of the operation than merely puncturing the capsule, vision will still be interrupted by the capsular part of the cataract. When we observe, therefore, that the dissolved lens is escaping into the aqueous humour, we should endeavour as completely as the state of matters will allow, to lacerate and destroy the anterior hemisphere of the capsule; and should we find after the absorption of the dissolved lens is effected, that the central aperture in the capsule is insufficient, either another attempt must be made with the needle, to clear away as much of the opaque membrane as will secure the transmission of the rays of light to the retina, or the capsule must be extracted through a small incision of the cornea or sclerotica.

4. We sometimes have to do with cases of cataract, in which the edge of the pupil, in consequence of previous iritis, is partially or completely adherent to the capsule. When the adhesion embraces the whole circumference of the pupil, to separate the capsule is almost impossible[6], so that as far as this structure is concerned, the formation of a central opening in it is all that we should attempt. The lens we displace or divide, according to the estimate we are led to form of its consistence. When the edge of the pupil, on the other hand, is bound to the capsule in one or two points only, as will be rendered evident on bringing the iris under the influence of belladonna, we endeavour, first of all, to tear or cut across the adhesions with the edge of the needle, then open up the centre of the capsule, and lastly displace the opaque lens. Before withdrawing the needle, the central aperture of the capsule may be enlarged or completed, unless we judge that enough has already been done, and that any thing farther should be left to another operation, after an interval of some weeks or months. The division of the adhesions between the iris and the capsule is sometimes attended with an effusion of blood.

5. Cases occur in which the cataractous lens instantly re-ascends, whenever the needle is raised in order to be withdrawn from the eye. Such an occurrence has been ascribed to a greater degree of adhesion than is natural between the lens and capsule, or between the capsule and the hyaloid membrane, and has been designated as *elastic cataract.* In this case, if we are sure that the second and third periods have been properly executed, we allow the lens to resume the situation whence it had been forced; we then carry the needle over its upper edge, and down behind the posterior hemisphere of the capsule; we move it upwards and downwards, so as to destroy the adhesion of the capsule to the hyaloid, bring up the needle from under the cataract into the posterior chamber, and displace the lens inclosed in the capsule.

After-treatment.—1. Experiments on the degree of vision recovered by means of the operation which has just been performed, are not advisable, as in the endeavours which the patient makes to discern the objects presented to him, the muscles of the eye are necessarily called into action, and this is apt to unsettle the cataract from its new situation.

2. The eyes are to be shaded by means of a light linen compress, fixed by a roller going round the head, or pinned to the nightcap.

3. Rest is to be enjoined, both of the eyes and of the head, for some days; the patient lying in bed, or sitting in a chair. The room is to be kept moderately dark. The food is to be of an easily digested kind, not too nourishing, nor of such a sort as to require chewing.

4. After three or four days, the eyes may be protected from the light by a green bonnet-shade; but ought not, for eight or ten days longer, to be employed in examining objects. After this period, they are gradually to be brought into use, the patient taking care to avoid whatever excites pain or redness of the eyes, or gives rise to epiphora.

Accidents during or consequent to the operations of displacement.—1. One of the least considerable of the accidents which are apt to follow these operations, is the formation of a small thrombus under the conjunctiva, in consequence of one of the visible vessels of the eye having been wounded by the needle; a thing which may easily be avoided. Should such a thrombus follow, it is to be left to itself; the blood contained in it will speedily be absorbed.

2. A small fungous excrescence sometimes rises from the wound made by the entrance of the needle through the coats of the eye. It may be touched once a-day with a solution of nitrate of silver, or if this proves ineffectual, with the same substance in the solid state.

3. Effusion of blood into the eye is not a frequent occurrence in the operations of displacement. Even when the iridal artery is divided, or the ciliary processes touched, the bleeding generally tends more to escape by the wound than to flow into the interior of the eye. At the same time, hæmorrhagy into the aqueous humour, suddenly obscuring the field of operation, does occasionally occur. In the majority of cases, the blood may safely be left to be removed by absorption. Rarely is it in such quantity as to produce pain or distention, or render necessary an opening at the edge of the cornea, with the extraction-knife, for its evacuation.

4. If the operator has entered the needle in a wrong direction, and plunged it deep into the eye, the point of it is apt to be buried at once in the substance of the lens, so that on attempting to proceed with the operation, the whole cataract moves forward towards the cornea. When the operator observes that this is the case, he must turn the needle several times round on its axis, and withdraw it a little, so as to free it from the lens, and then proceed to the second period of the operation, in the usual manner.

5. It can happen only from extreme carelessness, or rudeness of manipulation, that in introducing the needle into the posterior chamber, the iris is separated from the choroid, an accident which is attended by considerable discharge of blood into the aqueous humour. In this case, it is proper to withdraw the needle and

postpone the operation. The iris, if healthy, is not likely to return to its place, but a false pupil will probably remain permanently.

6. It sometimes happens that, on attempting to depress or recline the lens, it is suddenly tilted forward through the pupil. When this is the case, it may be possible, with some difficulty, to harpoon it with the needle, carry it back again through the pupil to its former situation, and then displace it as had been intended. I consider it better practice, however, immediately to extract the lens. For this purpose, the operator, keeping the lens steady in the anterior chamber by means of the needle, should make a section of somewhat less than one half of the circumference of the cornea, with the extraction knife, and either push out the lens with the needle, or laying hold of it with a hook, remove it from the eye.

7. There sometimes occurs, an hour or two after any operation with the needle, excruciating nervous pain in the eye, and in all the branches of the fifth nerve on the corresponding side of the head. The pulse is not affected, and the pain yields to doses of from forty to fifty drops of laudanum, repeated every three or four hours. Those who have been in the habit of dosing themselves with opium, are most liable to such attacks.

8. Violent bilious vomiting in the course of a few hours, or during the first night of the operation, is a frequent consequence of depression and reclination. This symptom, which is generally attended by severe pain in the eye and head, has been attributed to various causes, as injury of the ciliary nerves, or of the retina, at the moment of entering the needle, and pressure on the retina, or laceration of it, from displacement rudely and ignorantly performed. Fluid lenticular matter mixing with the aqueous humour, is a cause well ascertained. The ordinary means for checking vomiting are to be adopted, such as bits of ice swallowed at intervals of a few minutes, effervescing draughts, and small laudanum clysters, frequently repeated. Blood-letting ought to be had recourse to, as inflammation scarcely ever fails to occur in such cases. If the presence of dissolved lenticular matter in the aqueous chambers is the cause, the cornea is to be punctured (see p. 425), so as to allow the opaque fluid to escape.

9. Adhesion of the lids in the morning is a usual occurrence after any operation with the needle. It is of no consequence, and is to be preferred to an acrid watery discharge, or hot dry eye.

10. Inflammation of the retina and of the iris is to be apprehended after the operations of displacement, especially when the manipulations have been unskilfully executed, the suspensory ligament of the lens torn from its adhesion to the ciliary processes, or the needle kept long in the eye. Severe pain in the eye and round the orbit, coming on during the night, is generally the first symptom indicative of internal inflammation, after any operation on the eye. The sclerotica and conjunctiva become red, the colour of the iris changes, the pupil contracts, lymph is effused, the remnants of the capsule coalesce, become opaque, and adhere to the edge of the pupil; vision is extremely indistinct; and unless proper means of cure are adopted, onyx, hypopium, and destruction of the eye, may ensue. Free

blood-letting, both general and local; opium, internally and externally; calomel, so as speedily to affect the mouth; and belladonna, to expand the pupil, are the remedies chiefly to be relied on.

Chronic inflammation of the internal textures of the eye is a frequent consequence of depression or reclination. It is not attended by much pain, but prevents the eye from ever attaining a degree of healthiness sufficient to render it useful. The patient perhaps retains a considerable degree of recovered sight, for some weeks after the operation; but epiphora, varicose dilatation of the external blood-vessels of the eye, and in general a contracted, but sometimes a dilated pupil supervening, the sight becomes weak, and in a few months is extinguished. The true remedy for this state of the organ would be the entire removal of the lens, which, lying in the vitreous humour, operates exactly as a foreign substance would do in the same situation.

11. Amaurosis, with dissolution of the vitreous humour, irregularly dilated pupil, haziness of the cornea, and varicose dilatation of the external blood-vessels of the eye, is a common result of the operations of displacement. If the retina is pressed upon by a firm lens which has been depressed or reclined, insensibility to light is the necessary consequence. It sometimes happens, however, that after some days or weeks, the lens rises a little in the vitreous humour, the retina is thereby relieved, and the power of vision returns. Yet this result does not always follow; the lens may re-ascend, and the retina remain insensible. If the practitioner who has performed depression or reclination, sees reason to suspect that the very means which he had adopted for restoring vision, threatens to destroy it, he ought not to hesitate about withdrawing the displaced lens from the eye entirely. Introducing a bent needle through the sclerotica, the cataract is to be raised into its former situation, pressed forward through the pupil, and kept in contact with the cornea till a section is made, a hook introduced, and the lens laid hold of, so that it may be extracted.

12. If a lens of moderate consistence is stript of its capsule and depressed or reclined, it may dissolve partially or completely in the vitreous humour.[7] But if it be displaced with its capsule entire, it will suffer no solution; even stript of the capsule, a hard lens may remain unchanged for a great length of time. The annexed figure (*Fig.* 78.) shows the interior of the eye of a woman of seventy-three years of age, in which the lens, along with its capsule, was reclined by Dr. Emden. The cataract re-ascended, and three months after the first operation, the reclination was repeated. A segment of the cataract always continued visible behind the pupil, notwithstanding which the patient saw well for three years, when she died. The lens, contained in its capsule, was found entire, in the situation represented in the figure. Two blood-vessels were observed running from the ciliary body into the capsule.[8]

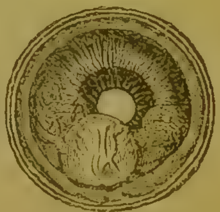
Fig. 78.
(From Soemmerring.)

Beer saw a lens, which had been depressed thirty years before by Hilmer, re-ascend in consequence of a fall upon the head; and in many instances, he had found cataracts, on dissection, lying in the vitreous humour, firm, and only slightly contracted, the lenticular part bearing no marks of solution, and the capsular none of maceration.[9]

Re-ascension of a depressed or reclined cataract, is so common an occurrence, that some have gone the length of speaking of the operations of displacement, as affording only a palliative cure.[10] Re-ascension may take place at any period after the operation, but is more apt to happen within the first fortnight than afterwards. The plan usually adopted by those who have practised displacement, has been to repeat the same operation after each re-ascension, till the lens has fairly settled in the situation which they assigned to it. Thus we find Mr. Hey couching some of his patients six or seven times.[11] I shall not pretend to say, that in all cases of re-ascension, extraction through the cornea should be practised; but of this there can be no doubt, that it is proper in all such cases, if extraction is not immediately resolved upon, to wait for a few weeks, and watch what may be the effect of the aqueous humour on the cataract. It is quite evident, that many of the cures attempted by displacement, and recorded as instances favourable to the plan of couching in preference to extracting, were actually accomplished by the dissolution of the lens after re-ascension. Thus, Mr. Hey tells us, that in one of his patients, "the cataract in the left eye appeared again; but in a few weeks it became sensibly wasted."[12] In a case operated on by M. Lisfranc, the lens re-ascended next day after the operation; for six months it underwent no apparent change, absorption then commenced, and in six weeks the third of the lens disappeared, so that a considerable share of vision was restored.[13] Should there be no appearance of dissolution after some weeks, it will become a question whether a repetition of displacement should be adopted, or an attempt made to extract the cataract. The latter cannot be safely attempted in the ordinary way, that is, by a section of half the circumference of the cornea, else the vitreous humour, in consequence of what it has suffered from the previous displacement, will almost certainly be evacuated; but the needle, passed through the sclerotica, must be employed to place the cataract in contact with the cornea; about a third part of the circumference of which being opened, the cataract is to be pushed out with the needle, or extracted with the hook.

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[1] Speaking of the situation of the lens in those who had been operated on by depression, and whose eyes he dissected after death, Daviel says—"Enfin il m'est arrivé de le rencontrer placé entre la retine et la choroïde, et ces deux membranes déchirées en plusieurs endroits."—Mémoires de l'Académie Royale de Chirurgie; 12mo. Tome v. p. 377; Paris, 1787.

[2] Betrachtung über die bishero gewöhnlichen Operationen des Staars; Nürnberg, 1785.

[3] Guy de Chauliac, who composed his work on Surgery in 1363, gives the following direction to the operator, regarding the time during which he should keep the needle in contact with the depressed cataract:—"Il la tiendra logée avec l'éguille pendant le temps qu'il faut mettre à dire trois fois le *Pater*, ou une fois le *Miserere*."

[4] Beobachtungen über die organischen Veränderungen im Auge nach Staaroperationen, p. 17; Frankfurt am Main, 1828.

[5] Very different views have been entertained respecting the degree of interference, which should be followed in regard to the capsule. 1. Some, by saying nothing about it, leave us to infer that they reckon, either

on the capsule being displaced along with the lens, or that it will be torn through, and its shreds left attached to the zonula Zinnii. 2. Others explicitly recommend the plan of displacing the capsule along with the lens. The attempt will generally fail; or, if it succeed, the eye will probably be severely injured by the zonula Zinnii being torn away from the corpus ciliare. The lens will remain without undergoing almost any diminution from absorption in the vitreous humour, and will be apt to re-ascend. 3. Of those who advise displacement of the lens without the capsule, some confine themselves to opening the posterior capsule only, leaving the anterior untouched. By this plan the aqueous humour is prevented from infiltrating the lacerated vitreous body, and the anterior capsule serves as a convex boundary to the vitreous lens. Should the anterior capsule become opaque, it can be removed by a subsequent operation. 4. Fearing the formation of a secondary cataract, by the anterior capsule becoming opaque, some, without interfering with the posterior capsule, but leaving it to burst under the pressure necessary for displacing the lens, devote themselves to a careful laceration of the anterior capsule before proceeding to displace the lens; and after it is displaced return with the needle to the pupil, lest the anterior capsule may still be entire, and although from its transparency it may not be visible, repeat the movements calculated to tear it into fragments. 5. Some both open the posterior capsule and lacerate the anterior.

[6] Mr. Hey relates (Practical Observations in Surgery, p. 82, London, 1803) a case in which, after twelve operations with the needle, he succeeded in detaching the capsule under such circumstances, and restored vision.

[7] Scarpa, Trattato delle principali Malattie degli Occhi; Vol. ii. p. 50; Pavia, 1816: Soemmerring, Op. cit., pp. 17. 22. 31.

[8] Soemmerring, Op. cit. p. 35.

[9] Lehre von den Augenkrankheiten; Vol. ii. p. 363; Wien, 1817.

[10] Ibid.

[11] Op. cit. pp. 79 and 81; London, 1803.

[12] Ibid. p. 77.

[13] Lancette Française, 2 Mars, 1837.

SECTION XI.—EXTRACTION.

§ 1. *Extraction through a Semicircular Incision of the Cornea.*

Extraction, through an incision of the cornea, appears to have been first practised, as a regular method of curing cataract, by Daviel, a French navy surgeon settled at Marseilles, about the middle of last century. He confesses that he took the hint from Petit[1], who, in 1708, opened the cornea to extract an opaque lens which, having re-ascended after depression, had fallen into the anterior chamber; and that he felt himself urged to devise some new mode of operating, by the want of success which he found to attend couching, and the destruction of the internal textures of the eye, disclosed upon dissecting the eyes of those who had been operated on in that way.[2]

Daviel commenced his operation of extraction, by passing a small lancet into the anterior chamber, close to the lower edge of the cornea. He then enlarged the incision, thus made, by another instrument somewhat similar to the former, but which, being sharp on the edges only, and blunt at the point, could with less danger to the iris be introduced into the anterior chamber. He completed the semicircular section, towards each side, with bent probe-pointed scissors. The inconveniences arising from the employment of so many instruments were remedied by Palucci, La Faye, Sharp, and others, who substituted a single knife, which being entered at the temporal edge of the cornea, passed across the anterior chamber, made its exit at the nasal edge of the cornea, and either by its progressive motion, or by being pressed downwards, completed a crescentic incision parallel to the lower edge of the cornea.

The operation of extraction divides itself into three periods. In the *first,* the cornea is laid open with the knife. In the *second,* the anterior hemisphere of the capsule is divided. In the *third,* the exit of the cataract, or the extraction properly so called, is accomplished. Some dexterous and experienced operators have attempted to run these different periods together; but it is absolutely necessary to study them individually, and it is always safer to execute each of them deliberately and by itself.

I do not generally dilate the pupil by belladonna, previously to performing extraction; but it is a practice strongly recommended by some, as they think it tends to lessen the danger of wounding the iris during the section of the cornea, renders the capsule more accessible when it is to be opened, aids in the easier exit of the lens, and by enabling us to avoid injury of the iris in these three periods of the operation, diminishes the chance of subsequent iritis.[3] I believe, however, that after the section of the cornea is made, and the aqueous humour evacuated, the pupil does not generally continue dilated.

1*st Period.* In laying open the cornea, care must be taken that the section be of sufficient size, of a proper form, and at a specified and regular distance from the sclerotica. It must be large enough to allow the exit of the lens without hinderance, and without the application of much pressure on the eye; and to permit of this, the incision will require to extend to at least a half of the circumference of the cornea. Mr. Ware supposes the whole circumference of the cornea to be divided into sixteen equal parts, and states that nine of these should be included in the incision. It must be of a proper form, not angular nor indented, but regular, smooth, and parallel to the edge of the sclerotica, that it may heal, if possible, by the first intention, and leave no cicatrice to prevent the entrance of light into the eye. It ought not to be close to the sclerotica, for then the iris is left insufficiently supported, and is apt to protrude; neither ought it to be far from the sclerotica, for then the incision will be too small (*Fig.* 79.), and if an opaque cicatrice follow, it will impede the passage of the light towards the pupil. A rim of cornea, at least the twentieth of an inch broad (*Fig.* 80.), should be left between the sclerotica and the incision. Being thus fairly an incision in the cornea, it heals more readily than if it were close to the union of the cornea and sclerotica.

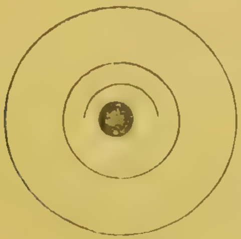


Fig. 79.

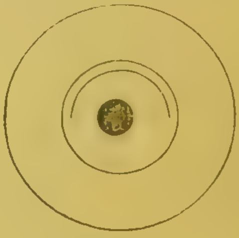


Fig. 80.

For a long time, the lower half of the circumference of the cornea was chosen for the incision. Wenzel, however, entering the knife on the temporal side, 45° above the horizontal diameter of the cornea, brought it out below the equator on the nasal side, and thus effected a semicircular section, one-fourth of which was above and three-fourths below the equator. The upper half of the circumference of the cornea is now generally preferred. The incision of the lower half is the more easily executed; and through such an incision, the opening of the capsule and the exit of the lens, are accomplished with the least difficulty. But if this incision does not heal by the first intention, and especially if it be prevented from healing by a protruding iris, then a broad unsightly cicatrice will remain, very much impeding vision when the patient looks downwards, or even altogether preventing vision in any direction. On the other hand, even supposing that the incision at the upper edge of the cornea heals only after suppuration, and that in consequence of protrusion of the iris through the incision the pupil has been dragged very much upwards, or is entirely closed or hid behind the cicatrice, still the lower part of the cornea, which is the most valuable part, may be left perfect, and by opening up an artificial pupil behind this part of the cornea, the patient will generally see as well as if the eye had a natural pupil. Through the incision at the upper edge of the cornea, it is somewhat more difficult to effect the division of the capsule, and to conduct the removal of the lens. Still, for the reason just explained, this is certainly the situation to be generally chosen. If the patient appears to have a particular difficulty in turning the eye down, or if the eye seems more than ordinarily irritable, the lower edge is to be preferred.[4]

Various forms have been given to the cornea-knife; but, on the whole, the best is that now generally known as Professor Beer's. (*Fig.* 81.) The cutting edge is placed at an angle of about 15° with the back, which is continued in a straight line from the handle. The point is double-edged for the length of a line; the strength and temper of the instrument such that the point is unbending. The blade should be slightly convex on both surfaces. To be capable of exactly filling the wound it inflicts, it should also gradually increase in thickness as it does in breadth; but it must not be too thick, lest by over-pressure on the aqueous humour, and through the medium of the aqueous humour on the lens, the hyaloid membrane be forced to give way, so that, on completing the section of the cornea, the lens bolts out of the eye along with part of the vitreous humour. The breadth of the knife should not be increased beyond an angle of 15°, as a broader knife than this, from the difficulty with which it penetrates the cornea, is apt to lead to an escape of the aqueous humour, and a falling of the iris upon the edge of the instrument.

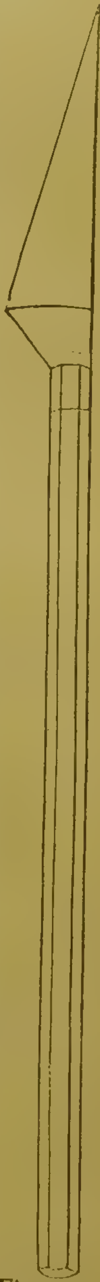


Fig. 81.

Immediately before using it, the surgeon tests the point of the knife, in the manner already (p. 771.) mentioned. He assures himself also, that its edge is perfectly sharp. If it is not so, it may be impossible to divide the cornea with it; or, if that part be torn through with a knife not very sharp, the incision may not heal, as it would probably do, if cut through cleanly with a keen-edged instrument.

In the further description of the operation, we shall suppose the left eye is to be operated on, and the upper half of the cornea to be opened. The right eye being covered by a monoculus or by a pledget and roller, the fingers of the assistant and operator are to be applied, as has been directed in Section VIII., and especial care is to be taken that the operator's middle finger is placed on the caruncula lacrymalis, and pressed well in between the eyeball and the angle of the eye, so that the eye shall be fixed, and prevented from turning towards the nose; a position which, if by inattention to the rule here laid down, the operator permits, he may find it impossible to complete the section which he has commenced. This is one of the most important cautions in the whole operation.

The patient is to be informed that the operation is attended with little pain, but requires perfect composure and silence on his part, and that he must on no account attempt to close his eyes, or squeeze them with his eyelids, but allow them to be as if he had no power over them. This passiveness is perfectly attainable by the use of chloroform, so much so indeed that the eye, from the powerless state of its muscles, is apt to be pushed before the knife.

If chloroform is not employed, the surgeon tells the patient to look at him. This generally brings the eye into the central position. The operation ought not to be commenced, if the eye is turned upwards or downwards, inwards or outwards. The surgeon sometimes requires to uncover the other eye, and desire the patient to look at him, to get the eye which is to be operated on into the central position. He then places the knife across the cornea, measuring, as it were, the distance which he is about to traverse, and touches the eye with the flat side of the instrument, so as to accustom it to the contact of a foreign substance, and thus render it less apt to start, when he proceeds to make the section.

In making the section of the cornea, the operator should observe the following rules:—

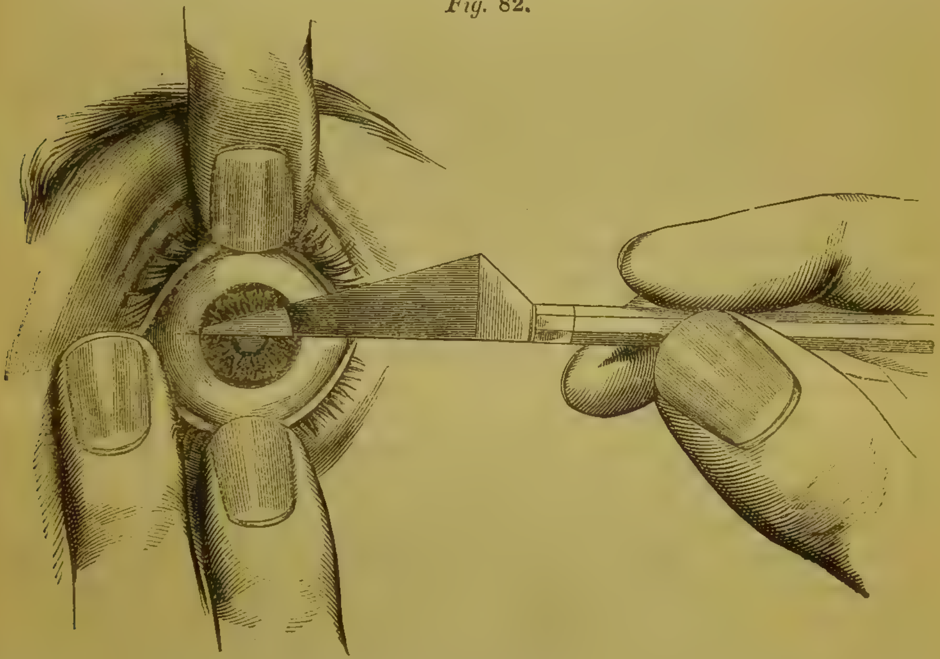
1. The point of the knife is to be entered on the temporal side of the cornea, at the distance of $\frac{1}{20}$ inch from the sclerotica (see *fig.* 81.); and care is to be taken that the cutting edge of the instrument is inclined neither towards nor from the operator. Should he enter the knife with its edge inclined forwards, he would find, as he proceeded, that the middle of the incision would be at too great a distance from the sclerotica; if inclined backwards, that the incision would go beyond the cornea, and into the iris and sclerotica.

2. The instrument is to be directed nearly perpendicularly to the lamellæ of the cornea, as if it were intended to go into the iris, in order that the lamellæ may be fairly penetrated, and the point of the knife arrive in the anterior chamber. If this rule is neglected, and the instrument introduced in a direction parallel to the plane of the iris, it may slip between the lamellæ of the cornea, and not pass into the anterior chamber at all.[5]

3. As soon as the point of the knife has entered the anterior chamber, or in other words, as soon as the *puncturation* of the cornea is performed, the handle of the instrument is to be carried backwards, so

that the flat surface of the knife becomes parallel to the plane of the iris, and its point directed towards the point of exit on the nasal side of the cornea. Fixing his eye on this point, which ought to be at the same distance from the sclerotica as the point of entrance, the operator carries the instrument cautiously, steadily, and unhesitatingly towards it, neither too quickly nor too slowly, and inclining the edge of the knife neither forwards nor backwards, but keeping it perfectly parallel to the iris. In traversing thus the anterior chamber, let the operator bend his eye on the point of *counter-puncturation;* if he do so, the point of the knife will be sure to follow; whereas, if he allow himself to be diverted to any thing else, for instance, to what the edge of the knife is doing, he may miss his aim, and bring out the instrument at a wrong place. Having reached the point of exit, he still carries the knife onwards till the counter-puncturation (*Fig.* 82.) is effected. He has now the eye completely under control. The middle finger, which it was so important should rest till now upon the caruncula lacrymalis, and prevent the eye from turning inwards, may be shifted to the lower lid; and if, by the operator's express desire, the assistant has been making pressure on the upper part of the eye, that pressure is to be discontinued.

Fig. 82.



4. The counter-puncturation being effected, the section of the cornea is to be completed, simply by the progressive motion of the knife, till it has cut itself out. In this part of the operation, no pressing upwards of the edge of the knife is allowable, much less any sawing motion, or any dragging of the eye towards the operator. The handle of the instrument is to be kept back, so that the extremity of the blade may pass over the nose as it advances. When the incision is nearly completed, the operator cannot proceed too cautiously. If the aqueous humour has been entirely retained till now, the knife should be turned a little on its axis, to allow it to escape. If this is neglected, the pressure of the knife upon that fluid, acting on the lens,

is apt to burst the hyaloid membrane, particularly if it is weak, as it often is in old age, and thus give rise to ejection of the vitreous humour. The instant that the section is finished, the upper eyelid is allowed to fall, the light admitted into the room ought to be moderated, the patient is to be assured that the worst of the operation is over, and recommended to compose himself.

Similar rules are to be followed, if the incision is made downwards, or semi-laterally.

When from the history of the case, or any particular symptom, there is a likelihood that the hyaloid is weak, or even dissolved, it is proper to stop before the incision of the cornea is quite finished, withdraw the knife, and proceed to the second period of the operation. After the capsule is opened, the small portion of the cornea remaining undivided, is to be cut across with a narrow probe-pointed knife, or with scissors.

2nd Period. Various instruments have been employed for opening or destroying the anterior hemisphere of the capsule, which is the object of the second period of the operation. Some employ a simple needle, like a common sewing needle, fixed in a handle, its point bent at a right angle (A, *Fig.* 83.); and with this they make a single scratch through the capsule, in general quite sufficient to allow the exit of the lens. Others employ a lance-shaped straight needle, the lance-shaped part being broader and shorter than that of the straight needle sometimes used for depression. The edges of this instrument are sharp, and one of them being turned against the capsule, it is proposed to divide this membrane by several oblique incisions running from right to left, and crossed by as many running from left to right, so as to reduce the capsule to a number of small lozenge-shaped portions, some of which might come away with the lens, but which, if left in the eye, could not unite to form a capsular cataract. The former is the easier mode of opening the capsule; the latter seems the more satisfactory, were it not ascertained that it is impossible to divide the capsule into lozenges, even with the very sharpest instrument.[6]

The patient being directed to look down towards his nose, and the upper eyelid being raised, the surgeon introduces the instrument behind the loose flap of the cornea, with its angle foremost, as far as the pupil; the point is then turned towards the surface of the capsule; and gentle pressure being exercised on the eye, so as to give a certain degree of tension to its contents, the division of the capsule is effected by one or by several incisions. If one incision only is made, it should extend to the whole diameter of the capsule, but not go beyond this, which might lead to opening the hyaloid by the edge of the lens, and allow a discharge of vitreous humour. The instrument is now cautiously withdrawn, with its angle foremost, to prevent it from catching in the iris or cornea; and the lids are again permitted

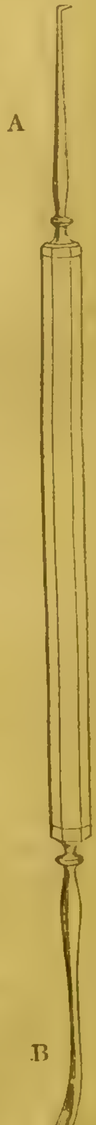


Fig. 83.

to close. The patient ought here to be cautioned not to squeeze the lids together, but merely to keep them shut, as if he were asleep.

3rd Period. If the gentle pressure exercised upon the eyeball, during the second period of the operation, were continued after withdrawing the instrument with which the capsule was divided, the lens would immediately follow. The experienced operator may run in this way the second and third periods together, but those who have not operated frequently, will find it advantageous to pause for a few minutes before proceeding to the third period.

It is usual to have the curette, scoop, or (as it is sometimes called) Daviel's spoon (B, *Fig.* 83.), attached to the opposite extremity of the same handle in which is fixed the needle for opening the capsule. Holding, then, the curette in the hand which formerly held the knife and the needle, the operator, with the thumb of the other hand, raises the upper eyelid, and directing the patient again to look down towards his nose, presses gently and continuedly on the upper and anterior part of the eyeball. The pupil is seen to dilate, the superior edge of the lens advances through the pupil, the whole lens passes into the anterior chamber, and makes its exit through the incision of the cornea, without any other interference, in general, or any other means of extraction being employed, than a continuance of moderate, not forcible, pressure. The curette is used to assist the extraction, only if the lens is arrested between the lips of the incision of the cornea, or if it appears falling into pieces.

The patient is desired again to close his eyes as if he were asleep, while the operator, having received the lens on his finger nail, may examine whether it is entire.

When the patient has recovered a little from the confusion arising from the admission of light into the eye, the surgeon, holding up his hand at the distance of about eighteen inches from the patient's face, may desire him to open a little the eye from which the cataract has been removed, the other eye being still covered with the pledget and roller, and to say whether he sees any thing. It were better, in some respects, to dispense with this; but the patient who submits to extraction, knows that such experiments are made and expects them, and if put to bed without having ascertained what degree of vision he is likely to recover by the operation, is apt to get anxious, and to make trials of his own, which may be much more detrimental.

The operator with his thumb now repeatedly and gently rubs the upper eyelid over the surface of the eyeball, raises the lid, and rapidly examines the appearance of the pupil and the state of the flap of the cornea. If the pupil is circular and clear, and the edges of the incision of the cornea accurately in contact, he desires the patient to look upwards, and then immediately to close his eyes, informing him at the same time, that he is not to make any further attempt to open them till he is desired to do so, but to keep them closed, without squeezing the lids together, and, in fact, exactly as if he were asleep. A strip of court-plaister, about an inch long and a quarter of an inch broad, is now to be applied from the middle of the upper lid to the middle of the lower, over the eye which has been operated on, and the same over the other. The eye is thus protected from the intrusion of foreign matters, and the patient is prevented from using it, while the eyelids gently support the flap of the cornea, and close the wound. A ribbon, with a fold of linen attached to it, is put round the head, outside the patient's nightcap, the fold hanging down over the eyes, and the ribbon pinned to the nightcap.

Modifications of extraction according to varieties of cataract, and peculiar states of the eye. — 1. In cases of capsulo-lenticular cataract, it is proper to attempt the extraction of the capsule as well as of the lens. Some do this before, others after the lens is removed.

The pupil being dilated by belladonna, and the cornea opened in the usual way, we may endeavour with the needle to divide the capsule circularly, as near its edge as the instrument can be applied without injuring the iris. The part of the capsule included within the circular division may sometimes be brought away on the point of the needle; but if this cannot be done, it should be extracted by means of a small toothed pair of forceps (*Fig.* 28, p. 219), and then the lens removed as in ordinary cases. This is the mode recommended by Mr. Ware.

Beer, on the other hand, first extracted the lens, and then attempted to remove the shreds of the opaque capsule, by means of the forceps. The instrument being introduced through the incision of the cornea and through the pupil, is to be opened so as to receive one of the shreds, and shut so as to hold it without any possibility of its escaping. Then with a twitch, the shred is to be extracted; and this is to be repeated till the whole of the shreds are removed.

Some surgeons think it safer to defer making any attempt to remove the opaque capsule when they extract the lens.[7]

2. We sometimes know from the history of the case, that the posterior hemisphere of the capsule is opaque; or immediately after the lens is removed, we observe that there still remains an opacity, impeding vision. If we are satisfied that this opacity consists neither in opaque shreds of the anterior half of the capsule, nor in some portion of the soft exterior substance of the lens retained in the eye, we may conclude that it is the posterior hemisphere of the capsule in a cataractous state. Perhaps the better plan in such a case, would be to allow the eye to recover from what has already been done, and by a subsequent operation to endeavour to remove the opaque membrane out of the axis of vision, or out of the eye. Some, however, have recommended that we should immediately proceed to destroy, and if possible, to remove the posterior half of the capsule. This they have attempted by means of a needle, of which one of the edges forms a hook or barb, so that it enters easily through the membrane in question, and being then turned one quarter round on its axis and suddenly withdrawn, brings along with it a portion of the diseased capsule. This manipulation is to be repeated, till at least a considerable aperture is formed for the transmission of light into the deeper parts of the eye, an object which will scarcely be effected without some loss of vitreous humour.

Accidents during or after extraction. — 1. The spirting out of the aqueous humour before the counter-puncturation is effected, is one of the most common accidents during the first period of extraction. The patient feeling the eye suddenly touched with the knife, perhaps turns the eye inwards, and the aqueous humour escapes. I have seen it occur from the patient's speaking at that moment, and the eye moving as he spoke. The iris, in consequence of losing its usual support, immediately falls forward, and folding over or under the edge of the knife, will be cut across, if the section is pursued.

The practice to be followed, is different according to the size of the opening which has been made in the cornea. When the knife has little more than entered the cornea, the common practice is to withdraw it, and defer the operation till a future day. I once saw even the slight injury thus inflicted on the eye, followed by severe and destructive inflammation. M. Desmarres is of opinion, that by waiting only for a few minutes, while the patient keeps his eyes closed, the aqueous humour may be sufficiently regenerated, to replace the iris in its natural situation, and to allow the operator to resume the section of the cornea.[8]

When the knife has perhaps half crossed the anterior chamber, and consequently has effected a large aperture in the cornea, before the loss of aqueous humour happens, the practice usually followed is to attempt to liberate the iris by pressure, and under this effect the counter-puncturation. This is attempted by applying the point of the forefinger forcibly on the cornea, over the entangled part of the iris, and pressing the iris upwards and away from before the knife, and back into its place. The finger being still kept on the cornea, so as to press it against the blade of the knife, and prevent the iris again falling forward, the knife is to be carried quickly across the anterior chamber, and the counter-puncturation effected. This once accomplished, there is little farther danger of the iris falling upon the edge of the knife, and the section is to be completed in the ordinary way.

If the iris cannot be made to retire by pressure, one or other of the following plans may be adopted. The common extraction-knife being withdrawn, the narrow-bladed probe-pointed knife (*Fig.* 84.) is to be introduced through the aperture previously made, and insinuated along the posterior surface of the cornea avoiding the iris as much as possible. The cutting edge being carried to the extremity of the wound, by withdrawing the knife a little, the incision is to be extended, and this is to be repeated till a semicircle of the cornea is divided. Another plan is to introduce, through the aperture already made, a double knife, somewhat like that of Mr. Guthrie, only smaller and thinner, one of its blades blunt and the other sharp pointed, and push it cautiously through the anterior chamber to the nasal edge of the cornea. The sharp-pointed blade is now to be pressed forward, so as to effect the counter-puncturation and finish the incision in the usual way. If the double knife is not at hand, a probe-pointed knife may be used instead, and when it has reached the nasal side of the cornea, an opening may be made over its extremity with another knife so as to allow it to come through, after which the incision is to be finished exactly in the same way as if the sharp-pointed knife only had been employed.

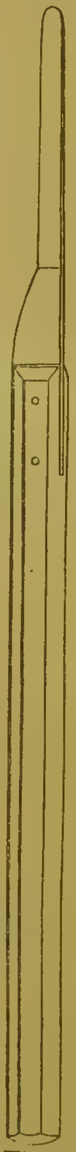


Fig. 84.

By some all these plans are disregarded, and we are advised rather to carry the knife on, and if the iris does not recede on pressure, to incise a portion of it, than have recourse to expedients much more likely to prove destructive than the accident they have been invented to remedy. A simply incised wound of the iris, or even one where a small portion has been cut off entirely, is not found to lengthen the period of recovery, to give rise to iritis, or to produce any other subsequent inconvenience than an enlarged and ill-shaped pupil.

2. When the point of the knife reaches the nasal edge of the cornea, the operator occasionally finds it difficult to bring it through, in which case he may derive advantage from pressing the cornea against the knife with his finger-nail. In other instances, the point of the knife is seen to bend to one side, so that it is impossible to perform the counter-puncturation in the ordinary way. When this is the case, the cornea may be opened on the nasal side with another knife, and then the one, which is already across the anterior chamber, may be carried through the opening, and the section completed. The double knife may also be useful in such a case.

3. Should the point of the knife, instead of being brought out through the cornea at the proper place, appear ready to penetrate through the sclerotica, it must be cautiously withdrawn a little, and then pushed through the cornea at the distance of $\frac{1}{20}$ inch from its nasal edge.

4. Too small a section of the cornea is a very frequent occurrence, in consequence of the operator bringing out the knife at too great a distance from the nasal edge, and perhaps considerably above the equator, of the cornea. In this case, the incision must be enlarged to a semicircle. There is no practice more apt to prove fatal to the success of the operation, than that of forcing the lens through a small section. Loss of vitreous humour, severe pressure upon the iris, and destructive inflammation are among the consequences to be dreaded.

The enlargement is effected with a knife or scissors, and the latter either straight or doubly curved. The incision made with scissors is not very apt to heal by the first intention; its edges are liable to swell, inflame, gape, and allow the iris to protrude. In cutting with the knife, the eye is more dragged, and the lens and vitreous humour are apt to fly out of the eye. The knife (*fig.* 84. p. 795) is narrow, straight, and rounded at the point, and is to be used in enlarging the section exactly as in cases of premature loss of the aqueous humour. Richter recom-

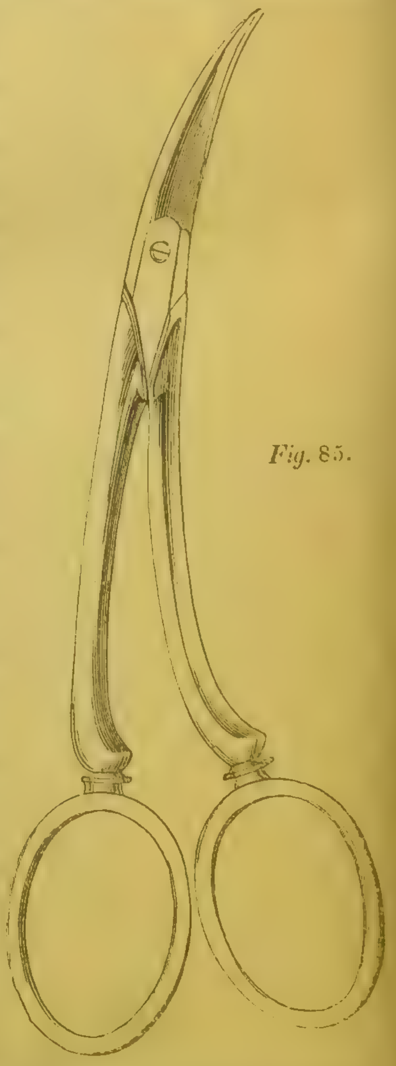


Fig. 85.

mends straight scissors, as cutting better than curved ones. Generally, however, Daviel's scissors are preferred, from their cutting in a curve concentric to the edge of the cornea. There are two pairs of them, the one so bent that it serves for dividing the temporal side of the right cornea and nasal side of the left, while the other pair serves for the temporal side of the left cornea and nasal side of the right. On the supposition that the incision is at the upper edge of the cornea, *Fig.* 83, represents the latter pair. Rarely will the incision require to be enlarged at both extremities; but upon no account is the operator to proceed to the second and third periods of extraction, if he is conscious that the section of the cornea is less than a semicircle. Standing behind the patient, and resting the scissors on the back of the finger which raises the upper eyelid, the surgeon opens them a little, and passes the one blade behind the middle of the flap of the cornea into the anterior chamber, while the other remains external to the cornea. The instrument is then to be carried close to the temporal or nasal edge of the cornea, according to circumstances, and with a single stroke the incision is to be enlarged to the requisite dimensions.

5. If the section is too close to the sclerotica, the conjunctiva is apt to form an impediment to its completion, the knife not dividing but stripping off a portion of conjunctiva from the sclerotica. When this happens, the knife is to be withdrawn and the conjunctiva cut through with scissors. The section being so close to the sclerotica, is apt to give rise to protrusion of the iris, evacuation of the vitreous humour, and inflammation of the eye.

6. Some operators make it a constant practice not to complete the section of the cornea with the usual extraction-knife, but to withdraw that instrument when the incision is nearly finished, and to divide the remainder of the cornea with the scissors, or the small probe-pointed knife. To the straight-edged knife some prefer one with a convex, and others one with a concave edge. The practice is decidedly proper, when the operator observes that he has unfortunately so inclined the edge of the knife first employed that, if he continues to press it onwards, the incision will probably extend beyond the cornea and divide the iris or sclerotica. When he sees that this is likely to happen, he should by all means withdraw the knife and complete the incision in the manner above mentioned.

Some advise the same practice on another ground, and one of unquestionable importance. It is just at the completion of the incision, when the motion of the knife is nearly parallel to the laminæ of the cornea, the resistance to the instrument greatest, and the pressure on the eye most severe, that the hyaloid is apt to burst and the vitreous humour to be ejected. To prevent this it is recommended that the knife be withdrawn, and the eye left for a minute or two at rest; after which, the second period of the operation is to be performed, and the incision finished with the scissors or the small probe-pointed knife.

7. Some patients cannot turn the eye sufficiently down to permit the upper section to be made; and in such, it is proper to perform the lower section. It sometimes happens, however, that the upper

section has been accomplished, when we find, on proceeding to open the capsule, that it is impossible for the patient so to command his eye as to turn it down sufficiently to expose the upper half of the cornea. In one case of this kind which happened to me, I was obliged to make pressure on the eye, and evacuate the lens without having had it in my power to open the capsule. The case fortunately did well. In other cases, I have been obliged to lay hold of the conjunctiva with a hook or a pair of forceps, and draw the eye down till I executed the second period of the operation. Such a procedure, with the cornea open, is very apt to give rise to rupture of the vitreous humour, or to hæmorrhage from the interior of the eye.

8. The iris is apt to be injured in all the stages of the operation. It is sometimes pricked in making the puncturation, it may fall in the way of the knife as the latter passes through the anterior chamber, or it may be transfixed in attempting the counter-puncturation. Incisions are thus made in the iris, and sometimes a piece of it is fairly cut out, especially when it falls before the knife and the operator, unsuccessful in pressing it back, continues the incision. A cut into the iris generally forms a permanent false pupil. If it be the edge of the natural pupil which is cut into, or if a portion of the iris, including the edge of the pupil, be removed, we have, after the case recovers, a large irregular pupil, which, though it looks ill, does not materially affect vision.

If the wound in the iris does not communicate with the pupil, on making pressure to promote the escape of the lens, the pupil may not dilate, or the lens may present itself at the accidental aperture. In either case, it is proper to divide, with Maunoir's scissors, the fibres intervening between the accidental aperture and the pupil, thus allowing the cataract to be extracted.

The iris is sometimes lacerated during the process of opening the capsule, or in withdrawing the needle employed for this purpose. During the second period of the operation, the eye should be steadied by gentle pressure, and the opening of the capsule finished without any unnecessary delay. If this is not attended to, the patient is apt to turn up the eye suddenly, so that the iris is torn, and the aqueous chambers filled with blood. In some cases, the blood is absorbed in a few days, and neither acts as a foreign body in exciting inflammation, nor prevents the healing of the wound. If it is observed, however, before closing the eye after the removal of the lens, that the aqueous chambers are filled with blood, it ought to be removed with the curette. I remember a case in which only a very little blood was discharged at the moment of the operation, from the iris having been touched with the needle, but for nearly a week blood continued to ooze from the eye, so as to tinge the fold of linen, and to dry on the cheek and nose. The restoration to vision was, in this case, very imperfect.

I have not met, in the course of my reading, with any case parallel to the following: —

Case 649.—Extracting the cataract from the right eye of a spare unmarried woman, about 50 years of age, 4th June, 1851, I had occasion to introduce the hook into the pupil to lay hold of the lens, and, in withdrawing the lens, I by chance caught hold of the iris, and removed the whole of it. It came away so easily, that the patient seemed to feel no pain, and I experienced no drag, as if anything extraordinary was happening. As the lens came out, I saw something black hanging to its edge; and, on examining this, I found it to be the iris entire. The eye instantly filled with blood. This was slowly absorbed; and, contrary to any hope that I could have entertained, the case did well. On the 26th of July, the patient called on me, with the eye strong, reading the sign-boards on the shops, as she went along, without a glass; no intolerance of light; and the aqueous humour clear. On the 9th of August, there was still a yellowish clot of blood behind the lower edge of the cornea. The central space was clear; and, with cataract-glasses, she saw distant objects distinctly, and read large type. On the 11th of October, the central space behind the cornea continued clear, and was somewhat of a triangular shape, while the circumference was filled with whitish threads and reddish particles. On the 3rd of April, 1852, her sight was so good that she read small type. The central space continued clear; while around it a sort of substitute for an iris had been formed by lymph.

9. When the operator, proceeding to the third period of extraction, makes pressure on the upper part of the eyeball, but observes that, notwithstanding this, the cataract does not advance through the expanding pupil, he ought to desist, and ask himself whether the section of the cornea be of the proper size, and whether he has reason to think that he has in a sufficient manner opened the capsule. If the answer in the affirmative is well founded, then merely by waiting a few minutes, rubbing the eye gently through the medium of the upper lid, moderating the light admitted to the apartment, and repeating the pressure on the upper part of the eyeball, the lens will probably advance, and make its exit in the usual way. But if the smallness of the section be the cause of the cataract not coming forward, the section must be enlarged; or if the capsule has been imperfectly divided, the second period of the operation must be repeated. Pressure is then to be employed as before, when, in general, the cataract will advance. The pressure must be at once moderate and sufficient. If it is too forcible, the hyaloid membrane is very apt to give way, and the vitreous humour to be ejected before the lens. If from timidity on the part of the operator, the pressure be too light or too soon relaxed, the lens may not advance, and the operator will distress himself with imaginary difficulties. Yet it sometimes happens that the section of the cornea is sufficient, the capsule sufficiently opened, and due pressure made, without the lens advancing, although the pupil may expand. This arises from an unnatural adhesion between the lens and the capsule, and is to be remedied in the following manner:—The operator is to continue the pressure till the upper edge of the lens appears in view, he is then to introduce a thin sharp curette, or small silver spatula (*Fig.* 31. p. 230.), through the pupil, and behind the lens, and by the motion of this instrument from right to left, to separate the capsule with the lens inclosed, from the hyaloid membrane. The cataract hook (*Fig.* 86.) is then to be introduced, and the lens and capsule extracted. This will scarcely be effected without some discharge of vitreous humour, but certainly less risk attends this mode of procedure than that of forcing out the cataract, under such circumstances by continued pressure.

8. The lens falling in pieces at the moment of extraction, part of them may remain behind the pupil. In this case, if the operator

rubs the eye gently through the medium of the upper lid, and then opens the eye, he will generally find that the fragments have advanced into the anterior chamber. If they do not escape on raising the flap of the cornea with the curette, they may be withdrawn with the cataract hook. Small particles may be left to dissolve in the aqueous humour.

It sometimes happens that, on examining the eye four or five days after the operation, we find the patient does not see so well as he did immediately after it was performed, and that the pupil, which then seemed clear, is now opaque. If there has been no pain nor other signs of inflammation, this opacity is probably owing either to some portion of the lens which had remained concealed in the edge of the capsular cavity, or to an effusion of unorganized lenticular substance, similar to what has been called by experimenters on the lower animals a *regeneration of the lens*, and which will clear away from behind the pupil in the course of a week.[9]

11. The operator, on opening the eye to proceed to the third period, sometimes perceives that part of the pupil is quite clear, or that it is altogether so. The lens has fallen down partially or entirely, into a dissolved vitreous humour. This accident may happen before the second period, but generally follows it. No pressure must be used, but the hook must be passed quickly down to the back of the lens, so that it may be caught and brought away. Some escape of fluid vitreous humour generally attends this accident. On one occasion, finding it difficult to get hold of the sunk lens, I filled the eye with water, which assisted in bringing the lens into view so that I hooked it out.

12. An escape of vitreous humour may take place before, along with, or after the exit of the lens. This accident may arise from one or other of a variety of causes; such as undue pressure on the interior of the eye, in consequence of too great thickness of the knife, or retention of the aqueous humour during the whole of the first period of the operation; immoderate or improperly directed external pressure on the eye; pressure with too small a section of the cornea, or an imperfect division of the capsule; any quick motion of the eyeball while the capsule is being opened, or afterwards and before the exit of the lens is accomplished, with perhaps an effort to wink; spasm of the recti or orbicularis palpebrarum. It is much more frequently the result of weakness of the hyaloid membrane from age or from disease, than of any other cause. When the eye is known to have been glaucomatous before becoming affected with cataract, when the iris or the cataract is in the least degree tremulous, or when the subject is advanced in life, and, in the ophthalmological sense, arthritic, we may expect a dissolved state of the vitreous tissue. If we operate by extraction in such cases, and at once extend our incision to a semicircle, we may lay our account with an ejection of vitreous humour.

Fig. 86.

If the capsule has been opened in a previous operation through the sclerotica, with the view, for example, of softening a hard cataract previously to attempting to divide it, or if displacement has been ineffectually performed, and the operator proceeds to extraction, he will almost to a certainty encounter an evacuation of vitreous humour.

If the escape of vitreous humour commences before the lens has been removed, no farther pressure must be made on the eye, but the hook is to be introduced, so as to lay hold of the cataract, which is to be withdrawn as speedily as possible. The eye is then to be shut, and gently rubbed for some time through the medium of the upper lid, in order to replace the iris, which is very apt, when there has been any escape of vitreous humour, to protrude through the wound of the cornea.

It not unfrequently happens, that the instant the section of the cornea is completed, the lens is ejected with violence, along with a quantity of vitreous humour. This is particularly apt to occur, when the fissure of the eyelids being short, they require to be a good deal dragged, and of course the eyeball considerably pressed upon by the fingers of the assistant and of the operator, to allow the cornea to be sufficiently exposed. In this case, also, we must endeavour, as much as possible, to replace the iris, and bring the edges of the wound of the cornea together. This is effected chiefly by continued gentle friction of the eyeball, through the medium of the upper eyelid.

The same practice is to be followed, if the evacuation of vitreous humour follows the exit of the lens, or occurs, as it sometimes does suddenly, when we direct the patient to look at any object held before him, after the removal of the cataract. In this case, the action of its muscles on the eye, seems to cause the accident.

In general, after a loss of vitreous humour, the cornea heals more slowly than usual, the cicatrice is broader, the pupil, of a shuttle-shape, is drawn towards the cicatrice, and vision is less perfect. The danger resulting from this accident, arises, within certain limits, not so much from the loss of vitreous humour directly, as from the gaping state in which the wound of the cornea is left, the hyaloid membrane probably hanging through it, keeping it from uniting, and causing the eye to inflame. If only a fifth, or even a fourth, of the vitreous humour is lost, vision may not be materially affected. If a third is lost, we cannot calculate on distinct vision. If more than a third is evacuated, the pupil generally closes, and the eyeball shrinks to a small size. Occasionally it happens, in consequence of the loss of even a moderate quantity of vitreous humour, that the pupil dilates, and the eye, although previously sensible to light and shade, is found on recovery from the operation, to be completely amaurotic.

13. As the patient closes his eye, after the exit of the cataract, the flap of the cornea sometimes turns down, so that its internal surface is in contact with the eyelid. It must immediately be pressed up into its place, by means of the scoop, and accurately adjusted by friction through the eyelid.

14. It sometimes happens, immediately after the exit of the lens, that the cornea sinks backwards, and presents a concavity, instead of its natural convexity. It is essential to remedy this mal-position, as

it is by no means certain that the cornea, when the aqueous humour comes to be re-secreted, will resume its proper direction. If it does not, protrusion of the iris, and destructive inflammation, seem certain to ensue. It is, in general, easy to remedy the unnatural state of the cornea, by introducing the scoop behind it, and pressing the centre of it gently towards us.

M. Maunoir, in a case of this sort, was led to adopt a different practice: —

Case 650.—Having performed extraction upon a man of 82 years of age, he perceived, to his regret, that although the pupil was perfectly black, and the iris uninjured, the anterior and posterior chambers of the eye were not replenished, the cornea became sunk and wrinkled, a few bubbles of air penetrated into the anterior chamber, and the patient had no vision. In these circumstances, M. Maunoir sent immediately for some distilled water, warmed it, placed the patient on his back, and poured the water round the eye. He then opened the eyelids, and raised the flap of the cornea. The water penetrated into the aqueous chambers, the wrinkles of the cornea disappeared, and its convexity was restored. Having kept the eye shut for some minutes, he then directed the patient to open it, and found it in the most satisfactory condition. The patient distinguished all the objects presented to him, as well as after the most successful operation. A slight pain was felt from the introduction of the water, but went off in a short time. The eye healed without difficulty; and, when opened a week after the operation, it was free from swelling and inflammation; the cornea was perfectly united, but the pupil was a little obscure, and the patient complained that he did not see so well as immediately after the operation. Six days, however, after the bandage was removed, the dimness of the pupil was much diminished, the sight grew stronger from day to day, and no doubt was entertained that the patient would soon be able to read common print.[9]

The practice in this case must be regarded more as a feat, showing what the eye will bear, than an example to be followed in similar circumstances. A bubble of air, getting behind the cornea, which appears partly to have led M. Maunoir to think of filling the aqueous chambers with water, is an accident of no moment. If it does not disappear on rubbing the eye gently, it may be left.

15. Immediately after the lens has escaped from the eye, the iris may become involved in the wound of the cornea, or protruded through it. If there is no escape of the vitreous humour, this accident is, in general, very easily remedied, merely by rubbing the eye through the medium of the upper lid, and then suddenly exposing it to the light. Should this not succeed, we may lay a wet cloth over the lids for a few minutes, which causes the pupil to contract, and then repeat the rubbing with the upper eyelid. Should the iris still remain prolapsed, we may endeavour to press it into its place with the curette, following up this with rubbing of the eye as before; and should this also fail, a small snip may be made in the protruding portion of iris, when it will often return almost of itself into the eye, in consequence of the aqueous humour, which was lodged behind it, draining away.

It is very different with a protrusion of the iris, which is apt to take place about the fourth day after the operation, or later, and which, though often attributed to some accidental blow on the eye, restlessness on the part of the patient, or improper attempts which he may have made to use the eye, ought, I am convinced, to be ascribed, in general, rather to the supervention of undue inflammation of the cornea, and of inflammation within the eye, than to any mere mechanical cause. Not denying that this protrusion is favoured by making the incision too close to the sclerotica, it appears to be much more frequently the consequence of too small a section of the cornea, so that the lens had to be pressed out of the eye with force; of the incision being made with a knife not perfectly sharp, so that a good deal of dragging was exercised in completing the section; or of the cornea being squeezed between the operator's nail and the knife.

This protrusion of the iris does not take place suddenly. We first of all observe the wound gaping a little, and its edges white, swollen, and everted. Next, the iris begins to show itself between the lips of the wound, and as the aqueous humour accumulates behind it, this *staphyloma iridis* increases. At the same time, the protruding portion of the iris inflames, and is united by effused lymph to the edges of the wound of the cornea. The conjunctiva and sclerotica redden, the discharge of tears is frequent and irritating, the patient feels as if some foreign substance of considerable bulk were lodged beneath the eyelids, the eye and supra-orbital region become painful, the skin dry and hot, and the pulse quick. The protrusion is apt to be increased, if the patient is affected with cough.

No direct attempt need be made to reduce the protruding portion of the iris; but means should be taken to prevent its increase, and to abate the inflammation on which it depends. The protrusion should be touched, from time to time, with the ten grains' solution, or a sharpened pencil of lunar caustic, which both tends to lessen the protrusion and to excite such inflammation as produces adhesion between the section and the prolapsed piece of iris. Should the prolapsus continue, it should be punctured, or snipped off with the scissors. Unless the patient's state of constitution forbids, a vein of the arm ought to be opened; leeches applied to the temple; and a blister behind the ear. The bowels should be acted on by a purgative, and calomel with opium administered till the mouth is affected. These are the most likely means to abate the inflammatory action upon which the protrusion probably depends. If the protruding piece of iris has not been snipt off, belladonna is at first to be avoided, as rather tending to favour the protrusion; but after the iris is united to the cornea, belladonna aids in approximating the edges of the wound of the cornea, by causing the protruding portion of the iris to contract.

A broad cicatrice of the cornea, with a dragging of the pupil towards the cicatrice, is the necessary consequence of this accident, even when the most appropriate means of cure are had recourse to. The pupil may be so much distorted, as to be completely hid behind the cicatrice, with the lower half of the iris very much on the stretch, and the lower half of the cornea clear, a state of matters which still affords a chance of vision being restored, by the formation of an artificial pupil. In more unfortunate cases, however, the inflammation is so severe and extensive, and is prolonged for such a length of time, before the prolapsed portion of the iris shrinks and the wound of the cornea unites, that the vessels of the eye are left varicose, and the retina insensible. Sometimes the neighbouring part of the sclerotica partakes in the tendency to protrusion and staphyloma, so that the eye remains permanently unsightly and irritable.

16. Although the healing, by immediate union, of such a wound as

that of the cornea after extraction, must depend chiefly on the exact coaptation of the wounded surfaces, and the absence of all inflammatory action, we meet with old or enfeebled individuals, in whom the wound does not close for a considerable length of time, notwithstanding the apparent fulfilment of both these conditions. In such cases the flap of the cornea is apt to become nebulous, and the aqueous chambers either remain empty, or from time to time are subject to sudden evacuation of their contents through the un-united incision. In a woman, about 50, on whom I operated at the Glasgow Eye Infirmary, the cornea did not unite for some weeks. She had long been in the use of tobacco and spirits in small frequent doses, and kept her room in the Infirmary excessively warm and airless. In a feeble emaciated old woman on whom I operated in private, the lips of the wound of the cornea continued perfectly close for 14 days; they then opened, the whole aqueous humour was discharged, and the cornea became flaccid. In the afternoon of the same day, the eye was again plump, and ultimately complete union was effected, and good vision restored.

¶Immediate union not taking place, the wound must close either by the process called union by adhesive inflammation, or by that of secondary adhesion or granulation. A want of power, or an indisposition in the part, or in the constitution, to take on inflammatory action, sometimes seems to interfere even with these processes, and especially the former. Mr. Raleigh has recorded three cases of extraction, in natives of Hindostan, in whom, from this cause, formidable obstacles presented themselves to a successful issue.

Case 651.—The first case related by Mr. Raleigh is that of a person about 55 years of age, rather infirm, from one of whose eyes a hard lenticular cataract was extracted, without any violence. No vitreous humour escaped; the pupil, previously dilated by belladonna, regained its circular figure; and the divided edges of the cornea closely adapted themselves to each other. The eye seemed to perish for want of action; the cut edges of the cornea continued in close connection, and there was no protrusion of vitreous humour: still the aqueous chambers did not fill; the cornea became flaccid, dim, and gradually opaque; after a time, slight chemosis appeared, which a few leeches removed. The case ended in a sinking of the whole globe.

In his second and third cases, Mr. Raleigh, observing a similar want of action in the eyes operated on, used with good effect stimulants to excite inflammation, such as ground pepper applied to the eye, a pepper poultice over the brow and temple, and solution of nitrate of silver to the eye. At the same time, he gave sulphate of quina internally.[10]

17. It sometimes happens, perhaps in consequence of carelessness in adjusting the flap of the cornea, that the edges of the wound unite in so imperfect a manner, as to be unable to withstand the pressure of the aqueous humour. The consequence is, that there is protruded from between the lips of the wound, a thin semi-transparent membrane, having the form of a vesicle, distended by aqueous humour, and giving rise to the sensation of a foreign body in the eye. This vesicular protrusion generally makes its appearance in the course of a few weeks, but I have seen it occur years after the operation. If the membrane which forms it, and which has generally been regarded as the lining membrane of the cornea, be punctured, the tumour subsides; but speedily re-uniting, the membrane is protruded as before,

so that it is better to snip it off, touch the part with a pointed pencil of lunar caustic, and, keeping the eye shut for several days, endeavour thus to procure a more perfect union. The cicatrice, in ordinary cases of extraction, slowly disappears, and in the course of a few months is sometimes quite invisible; but in every such case as has just now been described, the cicatrice will be considerable and indelible.

18. Hæmorrhagy into the interior of the eye, from the choroidal vessels or the central vessels of the retina, is an accident which always proves fatal to vision. It generally occurs in the course of the first night after the operation. The patient complains of severe pain in the eye; and, on exposing the eye, blood is seen oozing from between the lids, and the flap of the cornea is found to be raised by a clot. The bleeding is perhaps speedily checked by cold applications, but the mischief is already done, and the eye suppurates.

This accident is more apt to happen, if vitreous humour has been lost in the operation. It is sometimes brought on by a fit of coughing, or of vomiting. Weakness of the internal vessels is probably the chief cause, and as this state is likely to exist in both eyes, should an eye be lost in this way, it would be proper not to operate on the second eye by extraction.

19. Inflammation is the consequence most to be apprehended, after the operation of extraction. It attacks one or several of the textures of the eye, occurs with various degrees of severity, and comes on at uncertain periods of time after the operation. 1. The conjunctiva is frequently its seat, and then it presents symptoms of puro-mucous ophthalmia; the eye feels as if filled with sand; there is considerable chemosis, with puriform discharge, and adhesion of the lids. 2. In other cases, the cornea inflames more than is consistent with the healing of the wound; the lips of the incision become white, swell, and gape, the iris is apt to protrude, and a broad unsightly cicatrice, with anterior synechia, is the result. Perhaps as much clear cornea is left, with uninvolved iris, as gives the chance of an artificial pupil being formed, after some months. 3. In many instances, the sclerotica and iris inflame; the patient, sometimes so soon as six or seven hours after the operation, is affected with severe pulsative pain in and round the eye, aggravated during the night, followed by effusion of lymph from the iris, opacity of the shreds of the capsule, adhesions of the iris, and, it may be, closure of the pupil. A fortnight may elapse before iritis sets in; the wound may have healed perfectly, and there may have been every prospect of good vision, when, from some imprudent exposure, exertion of the eye, or error in diet, this kind of inflammation is excited. 4. In other cases, and especially where the flap of the cornea has been often lifted, and numerous instruments introduced into the interior of the eye, the inflammation, although internal, does not partake so much of the adhesive as of the suppurative character; so that the organ is in still greater danger of being destroyed. Pus is deposited in the anterior chamber, and in the substance of the cornea, the eyeball has the appearance of being greatly swollen, and is frightfully protruded from the orbit. Severe pain entirely prevents sleep, and is scarcely moderated by any kind of

treatment. The cornea gradually melts away under a process of ulceration, till scarcely a vestige of it remains. Sometimes it sloughs, at least I have seen the exterior lamellæ separate in the state of a slough. Gradually the eye shrinks, the whole front of it being left opaque. 5. The peculiar inflammation called by the Germans arthritic, and which, whatever be its nature, is undoubtedly a specific inflammation, is extremely apt to be excited by the operation of extraction.

These five varieties of inflammatory affections, following the operation of extraction, are greatly modified by the age, constitution, and previous habits, of the patient.

When the disease is limited to inflammation of the conjunctiva, with some degree of puro-mucous discharge, the danger is comparatively inconsiderable, and the usual treatment for catarrhal ophthalmia will generally suffice for its removal. The eye is to be fomented several times daily with tepid water, or with the collyrium of the bichloride of mercury; the edges of the eyelids are to be anointed with some mild salve, or the unguentum precipitati rubri; and if the symptoms do not yield to these simple applications, the solution of nitrate of silver is to be dropped once or twice a-day, upon the inside of the lower eyelid.

When the disease assumes the form of iritis, general and local abstraction of blood, but especially venesection, calomel with opium, and the external use of belladonna, are the means of cure to which we must have recourse.

The arthritic variety of inflammation will require moderate depletion, chiefly by means of leeches, along with purgatives, opium to control the pain, belladonna, counter-irritation, and, if the disease assumes, as it is very apt to do, a chronic form, the internal exhibition of tonics.

It is chiefly when inflammation affects the substance of the cornea, or assumes the shape of phlegmonous ophthalmitis, that the danger becomes greatly augmented, and a difficulty is often felt as to the choice to be made between a depletory and a stimulating plan of treatment.

In healthy, perhaps plethoric, subjects, not far advanced in life, and whose eyes, except that they were affected with cataract, were in a sound condition, it often happens, that, in the course of the first night, or even within a few hours of the operation, inflammation of a phlegmonous character sets in, with acute, throbbing pain in the eye and head. The eyelids, especially the upper eyelid, soon become swollen, of a florid red colour, and are extremely tender to the touch. Burning tears flow from the eye, succeeded by a thick yellow secretion adhering to the cilia. The conjunctiva is red and chemosed. There is smart symptomatic fever, with general excitement, a quick, strong, hard pulse, flushing of the face, and hot skin.

In old debilitated subjects, the attack does not occur so early; rarely within 30 or 40 hours of the operation, and often not for three or four days, during which, although the patients have perhaps made little complaint, they have often not slept. The attack sets in with severe pain in the eye and head; the lids are swollen, but the swelling is livid or œdematous; there is a thin muco-purulent discharge from the eye; the conjunctiva is considerably chemosed, but only slightly reddened; the pulse is generally quick, feeble, and irregular, but in some cases it is slow; the extremities are dry and cold; and there is a great feeling of depression.

Of neither of these sets of patients, can we judge by the pain alone, for in both it is severe. In both classes, the section of the cornea is apt to gape, the substance of the cornea becomes dusky and semi-opaque, and suppuration and ulceration are likely to destroy the eye.

Experience has shown, that a totally opposite plan of treatment requires to be adopted in these two classes of patients.

In the former class, we must have recourse to bleeding from the arm, cupping, and leeches. The bleeding from the arm must not be pushed to syncope, lest this bring on vomiting. The leeches will require to be frequently applied to the temple, the side of the nose, and even on the lids. Abstinence must be observed, and the bowels opened by purgatives. Calomel with opium ought to be administered, till the gums exhibit signs of being affected. Counter-irritation is to be used. The eye is to be carefully and frequently fomented with warm water.

In the latter class, the very applications which would aggravate the symptoms in the former, give striking and often immediate relief; namely, a dose of laudanum, with carbonate of ammonia, or ether; good broth, or other nutritive food in solution; and a moderate use of beer, wine, or spirits. Very soon after the adoption of this plan, the patient feels better, falls asleep, and wakes refreshed. In 48 hours, the swelling of the lids has been known to fall, and the section to close. As often as the pain recurs, warm fomentations are to be used. Warmth is also to be applied to the extremities and surface of the body.

The almost magical effect of the stimulating plan, in such cases, is well illustrated by Mr. Tyrrell.[11] It must not be supposed, however, that either depletion in the plethoric, or stimulants in the debilitated, are always, or often, to succeed in rescuing the eye when destructive inflammation is once set up, in consequence of the extensive wound inflicted in extraction. Unavoidable accidents, or undue violence in operation, an unhealthy condition of the eye, an artificial state of the constitution from the long-continued use of spirits, opium, or tobacco, and various other causes, must always render the risk of such an operation greater, in many instances, than any human prudence can avert.

20. Inversion of the lower eyelid is an occurrence which happens not unfrequently after extraction. It is attended by a considerable degree of œdema of the eyelids, of which it is probably a consequence. The inversion excites inflammation of the eye, and is apt to prevent union of the wound of the cornea. An attempt may be made to remedy it by painting the external surface of the lid with collodion. If this should prove ineffectual, recourse must be had to the excision of a fold of skin. (See p. 224.)

After-treatment.—The room in which the patient is to sleep after the operation, should be large and well aired, with a temperature of from 50° to 55° Fahr. and free from cold draughts. The patient ought neither to be loaded with unnecessary bed-clothes, nor exposed to cold from their deficiency. He may lie either upon his back, or on the side opposite to that of the eye which has been operated on. He should be put to bed with as little movement of the head and body as possible. The room is not to be made too dark, but is to be kept perfectly quiet, in order to avoid all causes of sudden alarm or starting. All unnecessary talking between the patient and those about him is to be prevented. A careful assistant or experienced nurse ought attentively to watch the patient when he wakes, taking care, especially, that he does not turn suddenly round upon the eye which has been cut, or put up his hand to rub the eye. If there is any particular reason to dread the latter accident, it may be proper to muffle the patient's hands, and pin them together, or down by his sides.

It is rarely the case, that the patient complains much of pain during the first few hours after the operation. If he does, a grain of opium may be given. Sleep, by closing the pupil, is useful.

The length of time during which the patient is to be kept in bed, is a point upon which there has been a wide diversity of practice. Wenzel was at one time in the habit of confining his patients to their backs, without change of posture, for a fortnight or three weeks, but afterwards he shortened the period of confinement to eight or ten days. Mr. Phipps, on the other hand, examined the eye on the morning after the operation, applied a shade, and allowed the patient to rise.[12] A middle course appears the most judicious. The patient may be allowed, in the course of the second day, to be raised up in bed for a short time, to relieve the irksomeness of lying. The incision may be looked at on the third or fourth day. On the fifth or sixth day, perhaps, the patient may be allowed to be out of bed for a short time. On the seventh or eighth, the eye may be fairly examined, but immediately afterwards covered with the shade. In ten or twelve days, the patient may be allowed to look at large objects. For the first fortnight, he should make no use of the eye, nor even open it, unless the surgeon be present. After a few days more, he may be allowed to walk about his room.

It is desirable that the patient's bowels should not be disturbed for the first 24 or even 48 hours after the operation, as the movements of the body in getting out of bed, and while at stool, may prove injurious to the eye. After 48 hours, a laxative clyster may be administered, if necessary. In healthy robust subjects, an antiphlogistic plan of diet is to be observed for eight days or more, according to circumstances; after which, soup may be allowed, and in about a fortnight after the operation, a little solid animal food. In persons of advanced life, in whom it is important that the reparative powers should be well kept up, good beef tea may be given from the first, in a day or two meat for dinner, and after five or six days a little porter.

The aqueous humour generally continues to be discharged from the eye for about 48 hours; in some cases, however, for a shorter period, and often for a much longer, even for weeks. Lest the discharge of the tears, and also of the aqueous humour, if it flows from the eye, should be prevented, it is improper to cover up the eye too closely, and still more improper to load it with dressings and bandages. It is of the utmost importance, however, to keep the eyelids still, and prevent any attempt to use the eyes. These objects are completely obtained by the strips of court-plaister, from the employment of which I have never witnessed any bad consequences. I generally allow those which are applied immediately after the operation, to remain for two or three days, but if the eyes are easy, for four or five days; after which I remove them, and, having bathed the eyelids with warm milk and water, without opening the eyes, replace the plaisters by new ones. This I now repeat every day, till I consider the wound consolidated.

§ 2. *Extraction through a Small Section of the Cornea.*

When treating of the accidents attendant on the operations of displacement, I mentioned that the lens occasionally passes through the pupil, and lodges between the cornea and the iris. It is not quite correct to say, that in this situation it is in the anterior chamber; for as the axis of the aqueous humour is to that of the lens as 3 to 4, it is evident, that after the lens has passed through the pupil, it will occupy not only the anterior chamber, but the posterior also, and even part of the space which it filled while in its natural situation. The iris consequently will be pressed backwards by the dislocated lens, and it will be easy to lay open the circumference of the cornea, without touching the iris. A hook being then introduced, the lens is to be laid hold of, and extracted. In such a case, however, whenever the lens possesses its normal size and consistence, the section, to admit of its easy extraction, will require to exceed considerably the third of the circumference of the cornea.

This mode of removing a lens which has fallen in front of the iris, has led, in a variety of other cases, where the lens is either soft, so as to permit of its being moulded through a small aperture, or considerably reduced in bulk, to the practice of opening only a third, or less than a third, of the circumference of the cornea. The wound in this way being less extensive, will in general heal more readily; and even should it inflame in some degree, and unite but slowly, will leave less deformity, and produce less impediment to the passage of light into the eye, than the broad semilunar cicatrice, which sometimes follows the common operation of extraction. The lips of the incision, when only a third of the circumference of the cornea is opened, will close more completely immediately after the operation is finished, so that we need not be afraid of prolapsus of the iris, and may therefore, without hesitation, dilate the pupil by belladonna before proceeding to the operation, which will both enable the lens to be more easily brought forward in front of the iris, and render injury of the iris less liable to occur. Through a small section, also, of the cornea, especially in cases of dissolved hyaloid membrane, the vitreous humour is less likely to be evacuated to any considerable extent.

Of the reality of some of these advantages I am able to speak decidedly, as I have employed this method of extraction in a variety of cases. I prefer it, when it is my object to extract a siliculose or secondary capsular cataract.

1. *Siliculose and secondary capsular cataracts.* — The following plan I have successfully adopted in cases of *siliculose* or *secondary capsular cataract,* the lens having been absorbed, either spontaneously or in consequence of an accidental wound of the capsule, or been removed by previous operation. I place the patient in the horizontal position, and pass a curved needle through the sclerotica, with which I gather together the opaque capsule into a mass, which I then push through the pupil. With the extraction-knife I open the upper or temporal edge of the cornea to about a third of its extent, if the case is one of siliculose cataract, but generally much less, if it is a secondary capsular one. I then introduce either a small pair of forceps, such as the cannular forceps, or Schlagintweit's hook, lay hold of the capsule, and either immediately extract it, or, if I find this opposed by any adhesion, turn the instrument round on its axis till the membrane is detached. In one case, in which I found the capsule so strongly adherent to the iris that I was afraid I might sooner sever the latter from the choroid than extract the capsule, I contented myself with prolapsing the capsule through the wound of the cornea, clearing in this way the pupil, and restoring a very useful degree of vision. Under such circumstances, iris-scissors, either common or canular, might be advantageously employed in dividing the half-detached capsule.

2. *Soft cataracts.* — Mr. Gibson, of Manchester, appears to have been the first to extract *soft cataracts* through a small incision of the cornea. He was led to adopt this practice from the great length of time which soft cataracts sometimes take to disappear by solution in the aqueous humour, added to the fact, that not only is the patient apt to grow anxious and to lose his health, but the eye to become affected with chronic irritability and inflammation, under this prolonged mode of cure. Mr. Gibson first of all freely ruptured the anterior hemisphere of the capsule with the needle, and after two or three weeks, proceeded to extract the pulpy lens. For this purpose he punctured the cornea near its temporal edge with a broad extraction knife, and if he had any doubt of the capsule having been freely lacerated in the former operation, he directed the point of the knife obliquely through the pupil, so as to make a more free division of the capsule. On withdrawing the knife, part of the aqueous humour and some portion of the cataract were evacuated. The curette was next introduced through the incision, and towards the pupil; and by that instrument the whole of the cataract was commonly removed by degrees, and the pupil rendered perfectly clear. Its removal was generally much facilitated by gentle pressure, towards the vitreous humour, with the convex surface of the curette, whilst the point of the instrument was inserted through the pupil.

Mr. Gibson observes, that it occasionally happens, upon introducing the curette, that a considerable part of the cataract appears too solid for removal, and only a small portion escapes in a pulpy state. The nucleus of the lens is sometimes much more solid than the rest, and cannot be readily extracted in this way; yet, much oftener the difficulty arises wholly from the smallness of the aperture in the capsule, so that it allows only an inconsiderable part of the cataract to pass out at a time, the capsule having perhaps been tougher than usual, and not easily lacerated in the preparatory operation with the needle. In such a case, the opening into the capsule may be extended, either by means of the curette, or by the needle commonly used for lacerating the capsule; or, if this membrane appears uncommonly firm, it may be divided with iris-scissors.

Mr. Gibson concludes, that by this operation, the repeated use of the needle may be safely superseded, and the eye exposed to less risk of injury and inflammation. He adds, that in many instances, no trace of inflammation, or of any operation, could be seen on the eye the next day; nor had the iris ever been injured, or even irritated in the slightest degree, by the use of the curette.[13]

This method of removing soft cataract has been adopted by Mr. Travers, with the difference, that instead of opening the capsule with the needle passed through the sclerotica, and then waiting for two or three weeks, he begins his operation, having previously dilated the pupil, by a quarter-section of the cornea, dipping the point of the knife into the pupil, and freely lacerating the capsule. The fluid cataract, he states, is instantly evacuated with the aqueous humour; the flocculent cataract, taking an oblong shape, frequently passes out entire; and the caseous cataract piecemeal, through the hollow of the scoop, on gently depressing the margin of the pupil.[14]

3. *Firm cataracts.*—Mr. Travers[15], Sir William Adams[16], and others, have had recourse also to the extraction of *firm cataracts* through a section of the cornea less than a semi-circle.

The pupil being dilated by belladonna, the steps of the operation are, to slit open the anterior capsule with a small bent needle, introduced through the sclerotica; tilt the lens forward through the pupil; keep it fixed by means of the needle, which is now committed to the charge of the assistant; open the circumference of the cornea to fully one-third of its extent; withdraw the needle; introduce a hook, lay hold of the lens, and extract it.

The opening in the capsule will require to extend to its whole diameter, else the dislocation of the lens will not be easily accomplished. The dislocation is usually effected by pressing with the needle near the lower or upper edge of the lens, so that the opposite edge from that which is pressed upon is tilted forwards through the pupil; and it is desirable that the lens should revolve, so that its posterior surface comes to be applied against the cornea. If the operator is satisfied that the capsule is sufficiently opened, and yet fails in bringing the lens forwards by pressing back one or other of its edges, he may withdraw the needle from the posterior chamber, by carrying it under, and hence behind the lens, which he must then push forwards through the pupil. Retaining the needle in contact with the lens till the section is finished, or even keeping it in the eye till the cataract is extracted, is no doubt of use, as it secures us against the lens falling back into its former situation, which, if the vitreous humour is fluid, is very apt to happen. At the same time, unless the patient be very still, the needle is apt to lacerate the iris, and cause bleeding into the eye. Some operators, therefore, withdraw the needle immediately after the lens is dislocated. The incision of the cornea is to be executed exactly as the semi-circular incision, namely, by carrying the knife across the anterior chamber, unless there is reason to think that the vitreous humour is dissolved, in which case it is better to make an opening at the temporal margin of the cornea, and enlarge it upwards and downwards with the probe-pointed knife. If this plan is not followed, but the extraction-knife carried across the anterior chamber, the cataract is very apt to be forced back through the pupil into the vitreous humour, where it sinks to the bottom. The incision being made, the hook is to be introduced, flat, between the lens and the iris, as far as the centre of the pupil; the point of the instrument is then to be turned forwards, and the cataract laid hold of by the surface which happens to be towards the vitreous humour. The extraction is accomplished without any pressure on the eye, which constitutes the great recommendation of this mode of operating, in cases where we have reason to suspect the hyaloid membrane to be unsound.

§ 3. *Extraction through the Sclerotica.*[17]

At the end of his "Improved Method of Opening the Temporal Artery," published in 1783, Dr. Butter describes a method of extracting the cataract through the sclerotica, by means of an instrument, similar to that which was afterwards employed for the purpose by Sir James Earle. Dr. Butter had tried the method he describes on the dead body only.

O'Halloran proposed[18] to push the point of a double-edged knife through the sclerotica, at $\frac{1}{3}$ line from the cornea, and hence through the ciliary ligament into the anterior chamber. The incision was then to be enlarged downwards and upwards, till a semi-circle of sclerotica was divided; the anterior capsule was to be opened, and the lens extracted. He does not say that he ever performed the operation.

Mr. B. Bell[19] suggested extraction through the sclerotica as a mode of operating, not only practicable, but in which the cornea and iris would be exempt from all direct injury. His experiments on the lower animals led him to believe, that the inflammation induced by an incision through the sclerotica was not more considerable, nor the cure in any respect more difficult, than when extraction was performed in the usual manner. He recommended the opening to be made in the upper part of the eye, the knife being entered about $\frac{1}{10}$ inch behind the cornea, and the incision to be of sufficient size for allowing the cataract to pass. A sharp curved probe was to be introduced, the point of which was to penetrate the lens, which might by this means be removed without any pressure upon the eyeball.

A remarkable case of wound of the eye, attended with evacuation of the lens, led Dr. Löbenstein-Löbel[20] to form a favourable opinion of extraction through the sclerotica, but he does not appear to have ever put the operation in practice.

I have already (p. 402) related a case, in which I extracted a crystalline lens from under the conjunctiva; it having been propelled, by a smart blow on the eye, through a laceration of the choroid and sclerotica. The opening through these tunics was already healed, the pupil clear, and the retina perfectly sensible. Such facts as this would lead us to pause, before we absolutely reject the operation of extraction through the sclerotica.

I cannot pretend to speak with much precision of an operation which I have only once attempted on the human eye. I should consider it proper, however, to divide the capsule with the needle before opening the sclerotica and choroid with a double-edged knife; to select the upper or temporal side of the eyeball for the incision; to make it parallel, not perpendicular, to the edge of the cornea; to introduce the knife at the distance of a line behind the edge of the cornea, so that it may leave the ciliary ligament untouched, but pass through the ciliary muscle and ciliary processes into the lens, without wounding, if possible, the suspensory ligament of the lens or the Petitian canal; and to extract the lens with a hook. Of course, pressure on the eyeball in this operation, is altogether out of the question.

It would appear from the testimony of Wenzel[21] (which, however, is given in rather an unfriendly spirit), that Janin attempted extraction through the sclerotica on seven patients in the *Hôtel des Invalides* at Paris, but in all seven unsuccessfully.

For extraction through the sclerotica, Sir James Earle employed a small lancet, moving backwards and forwards between the blades of a pair of forceps. This instrument being introduced through the sclerotica and choroid, the lancet is withdrawn by means of a spring contained within the handle, while the forceps is left behind. The blades are then opened, and the cataract seized and brought away. Sir James entered the instrument just behind the iris. In the first three operations which he has related, he introduced it in such a manner that the incision ran parallel to the edge of the cornea, and of course divided a considerable number of the choroidal vessels; but in his fourth operation he appears to have introduced the instrument in such a manner that the incision would form a line perpendicular to the edge of the cornea, or, in other words, run parallel to the course of the choroidal arteries. Having retracted the lancet, he then turned the forceps round, so that they might embrace the cataract; a mode of procedure by which he thinks a discharge of vitreous humour less likely to occur. He states, also, that the wound which is made perpendicular to the edge of the cornea heals with the same facility as the other.[22]

The following are some of the advantages, mentioned by Sir James, as possessed by extraction through the sclerotica. The wound need not exceed a fourth of the size of the incision required in the ordinary operation of extraction through the cornea; in the passage of the forceps through the vitreous humour and in the use of them afterwards, not nearly so much derangement of the interior of the eye is produced as attended the employment of the needle in the old operation of couching; as the part through which the incision is made performs no motion, the edges of it remain in contact, and heal with comparative facility.[23]

Quadri[24] of Naples, has put the operation of extraction through the sclerotica more completely to the test than any other surgeon. He has operated on 25 eyes, and on 11 of these successfully, a proportion too small to tempt any one to think of abandoning extraction through the cornea, for the operation through the sclerotica.

The dangers principally to be feared, in extraction through the sclerotica, are bleeding from the choroid, to such an extent as to hide the cataract from view, atrophy of the eye from a profuse loss of vitreous humour, and amaurosis from the injury which the retina is likely to sustain.

I have seen siliculose and secondary capsular cataracts extracted through an incision of the sclerotica, of about 2½ lines long. In such cases, the loss of vitreous humour was great, and the eye was left in a state of incomplete amaurosis, which I am inclined to attribute to the length of the incision. A safer plan is to extract such cataracts through a smaller incision; indeed, a mere puncture will often suffice. A bent needle being first of all to be passed through the sclerotica at $\frac{1}{6}$ inch from the edge of the cornea, the opaque capsule is to be carefully and completely detached from the vitreous humour and zonula Zinnii. If there are any tags between the iris and the capsule, they must, if possible, be divided. The needle being withdrawn, a pretty broad iris-knife, or the point of the extraction-knife, is to be passed through the opening left by the needle, and the wound enlarged to the length of a line. Schlagintweit's hook, or the cannular forceps, is then to be introduced, and the capsule seized and extracted. Any common forceps, or such spring-forceps as is described and figured by Albinus, is improper for the operation, as requiring much too large an incision.

In this operation, a few drops of blood generally escape from the choroid. The operator should place the extracted capsule in water, and examine whether it is entire. If any portion of it is seen remaining in the eye, the hook or the forceps should be re-introduced, in order that it may be extracted; but the pupil, although previously dilated by belladonna, generally contracts so much immediately on withdrawing the portion of capsule first seized, that the remains of it may escape being seen till next day, when the pupil is again found widely expanded. I have seen amaurosis follow also this method of operating; oftenest, however, when there was reason to believe the retina previously unsound..[25]

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[1] Mémoires de l'Académie Royale des Sciences, Année 1708, p. 311; Amsterdam, 1750.

[2] Mémoires de l'Académie Royale de Chirurgie; 12mo; Tome v. p. 369; Paris. 1787. In 1707, Mery had seen Saint-Yves perform extraction in a case similar to that in which Petit operated in the following year, and to which Daviel refers. Mery was led from the success of Saint-Yves' operation, to recommend extraction through the cornea as a mode of removing cataract worthy of being generally adopted, remarking, "qu'on risque moins à tirer la cataracte en dehors qu' à l'abattre au dedans de l'œil."—Mémoires de l'Académie Royale des Sciences, Année 1707; p. 666; Amsterdam, 1746.

[3] See Raleigh, Transactions of the Medical and Physical Society of Calcutta; Vol. iv. p. 385 ; Calcutta, 1829.

[4] It is mentioned in books, that Wenzel, Richter, and B. Bell practised, or at least recommended, the upper section. The first Wenzel's common operation was a semilateral section, parallel to the temporal and lower edge of the cornea ; but in certain cases, as when the lower part of the cornea was leucomatous, he made his section parallel to the nasal and superior edge. In this way he operated, as his son relates (Traité de la Cataracte, pp. 132, 135 ; Paris, 1786), on the Duke of Bedford, and on the celebrated Leonard Euler. All that Richter says on the subject (Treatise on the Extraction of the Cataract, p. 59 ; London, 1791), is, that the upper section is practicable. B. Bell had tried the upper section only on some of the lower animals; but he states (System of Surgery, Vol. iv. p. 238 ; Edinburgh, 1801) several reasons for preferring it to the common method of making the incision parallel to the lower edge of the cornea.

Santerelli was the first (Delle Cateratte, p. 79 ; Forli, 1811), as far as I know, who actually made the section, not semilaterally, as Wenzel had done, but at the upper edge of the cornea. This he did at Berlin, in 1795, with a double-edged knife or broad lancet, the point of which he introduced directly into the anterior chamber, from the middle of the upper edge of the cornea, in the expectation of forming an incision of sufficient extent merely by pressing the instrument on towards the lower edge of the cornea ; a method of operating in which it would be impossible to make a section of more than from a quarter to a third of the circumference. The method of Santerelli is a bad one, and is entirely abandoned.

The best operators, both of this country and of Continental Europe, are at present following exactly the plan recommended by B. Bell, who says, " The upper part of the cornea is cut with the same ease as the under part of it ; the same instruments being employed, and the surgeon, patient, and assistants being placed in the same manner ; only in this case the knife must be introduced with the cutting edge of it towards the upper part of the eye."

[5] See case by Paget, Edinburgh Medical and Surgical Journal; Vol. ix. p. 280 ; Edinburgh, 1813.

[6] " Quand une ouverture est faite dans cette membrane, l'aiguille entraine avec elle sous la pression qu' elle exerce, la lèvre correspondante de la solution de continuité, mais ne fait pas de nouvelle incision. Je me suis assuré de ce fait sur les lapins, en introduisant une aiguille à travers la cornée, et in disséquant l'œil après avoir sacrifié l'animal."—Desmarres, Traité des Maladies des Yeux, p. 607 ; Paris, 1847.

[7] Tyrrell on Diseases of the Eye, Vol. ii. p. 416 ; London, 1840.

[8] Op. cit. p. 618.

[9] Quoted from the Bibliothèque Universelle, for October, 1829, in the Journal of the Royal Institution for November, 1830, p. 191.

[10] Transactions of the Medical and Physical Society of Calcutta; Vol. iv. p. 350 ; Calcutta, 1829.

[11] Practical Work on the Diseases of the Eye ; Vol. ii. p. 427 ; London, 1840.

[12] On the Treatment of Patients after the Operation for the Cataract ; by Jonathan Wathen Phipps ; published as an Appendix to Wathen on Fistula Lachrymalis ; London, 1792.

[13] Practical Observations on the Formation of an Artificial Pupil ; to which are annexed, Remarks on the Extraction of Soft Cataracts, &c. p. 103 ; London, 1811.

[14] Further Observations on the Cataract ; Medico-Chirurgical Transactions, Vol. v. p. 406 ; London, 1814.

[15] Ibid.

[16] Practical Inquiry into the Causes of the Frequent Failure of the Operations of Depression and Extraction, pp. 138, 283 ; London, 1817.

[17] Löbenstein-Löbel conjectured that extraction through the sclerotica was the method adopted by Kerkringius, Burrhus, Taylor, and Woolhouse, when they boasted of having restored a young and acute vision to aged people, by removing the corrupted and turbid humours of the eye, and replacing new ones in their stead ; but it is very unlikely that extraction through the sclerotica was practised by any of these operators.

[18] Transactions of the Royal Irish Academy, 1788 ; p. 139.

[19] System of Surgery ; Vol. iv. p. 246 ; Edinburgh, 1796.

[20] Edinburgh Medical and Surgical Journal ; Vol. xiii. p. 56 ; Edinburgh, 1817.

[21] Traité de la Cataracte, p. 33 ; Paris, 1786.

[22] From some experiments which I have made on the lower animals, I am convinced that an incision through the sclerotica, perpendicular to the edge of the cornea, gapes less, and therefore heals sooner, than one parallel to the edge of the cornea. At the same time, it is evident that an incision 5 lines long, which will be necessary for the extraction of the lens, the mere diameter of which measures 4 lines, must, if perpendicular to the edge of the cornea, implicate the retina.

[23] Account of a New Mode of Operation for the Removal of Cataract ; London, 1801.

[24] Annotazioni Pratiche sulle Malattie degli Occhi ; Lib. iii. p. 167 ; Napoli, 1827.

[25] On the Extraction of Membranous Cataracts through the Sclerotica, see Albinus De Catarrhactâ (1695), Halleri Disputationes Chirurgicæ, Tom. ii. p. 61 ; Lausannæ, 1755 : Freytag, De Cataractâ, (1721),

Ib. p. 65: Earle, Op. cit.: Brett, Medical Gazette, Vol. xx. p. 415; London, 1837: Middlemore, Ib.; Vol. xxii. pp. 56, 158; London, 1838: Ib., May 5, 1838, p. 255.

SECTION XII.—DIVISION.

§ 1. *Division through the Sclerotica.*[1]

Syn.—Posterior Operation for Absorption. Hyalonyxis, from *ὑαλοειδης, vitreous*, and *νύττω, I puncture.*

In the days of Celsus[2], breaking down the cataract into fragments with the couching needle, was regarded as a proper supplementary step to displacement, when this could not be satisfactorily performed. Barbette, Read, and Maître-Jan, all availed themselves of their knowledge of the fact, that a cataract which had been merely cut up and left in its ordinary situation, would after a certain time disappear. Barbette[3] states, that in such circumstances, vision would be restored after seven or eight weeks; Read[4] employs the words *consumed* and *dispersed* to express the disappearance of the pieces of the divided cataract; Maître-Jan[5] observes that this disappearance, which he styles a *precipitation*, takes place as well in the anterior as in the posterior chamber, and notices its connection with a laceration of the capsule. Pott[6] appears to have been the first, not merely to make use of the term which we now employ in speaking of the disappearance of the cataract, namely, *dissolution*, but to adopt a laceration of the capsule as a distinct mode of operating, independent of depression.

It is evident, that in this mode of operating, the object is not to remove the cataract immediately, but merely to expose it to a natural means of cure, namely, the solvent action of the aqueous humour. This may be done in two ways; viz. *first*, by destroying the front of the capsule, so that the aqueous humour gains admittance to the lens; and, *secondly*, by dividing the lens into fragments, and pushing these into the aqueous humour. Both of these objects may certainly be accomplished at one operation; but it is better to operate twice, or oftener, than, by doing too much at once, to endanger the safety of the eye. I have long made it a rule to confine myself in the first operation to little more than a careful comminution of the anterior hemisphere of the capsule. The caution delivered by Mr. Hey is peculiarly applicable to the operation of division. "One principal thing," says he, "to be kept in view by the operator is, to do no harm. If he secures this, he will almost certainly do some good, and often much more good than he expects."[7]

Division through the sclerotica naturally divides itself into four periods. In the *first*, the needle is introduced through the tunics, and into the vitreous humour; in the *second*, the instrument enters the posterior chamber; in the *third*, the anterior hemisphere of the capsule is divided; in the *fourth*, the lens is scraped or cut into fragments, and these are pushed into the anterior chamber.

The pupil is to be dilated by belladonna, in the manner directed at page 777.

A bent needle is to be preferred for tearing through the capsule and opening up the texture of the lens; a straight one, if our object is to cut the lens into pieces. These two methods must carefully be distinguished from one another, as well as from a third kind of operation with the needle, in which the cataract is drilled by a rotatory motion of the instrument on its axis. The *first* of these methods of using the needle may be called *laceration;* the *second, discission;* the *third*, which is rarely practised except through the cornea, *terebration.* We shall first direct our attention to the method by *laceration.*

The size of the bent needle for this operation ought to be half that of the needle for displacement, the measurements of which, along with delineations of its form, are given at p. 778. Its neck ought to be round, and its edges as sharp as its form will permit.

1*st Period.* The first period of the operation is exactly the same as in depression and reclination. (See page 778.)

2*nd Period.* The second period commences with a double motion of the needle, by which it is made to perform a quarter of a revolution on its axis, so that its convex surface is turned forwards, and its concave surface backwards. At the same time its handle is to be carried back towards the temple, and its point forwards, to the interval between the circular edge of the ciliary processes, and the circumference of the lens. The operator now slowly pushes on the needle between these parts into the posterior chamber. He sees its point advancing from behind the temporal edge of the pupil (*Fig.* 87.), and carries it on through the posterior chamber, till its point reaches the centre of the anterior hemisphere of the capsule.

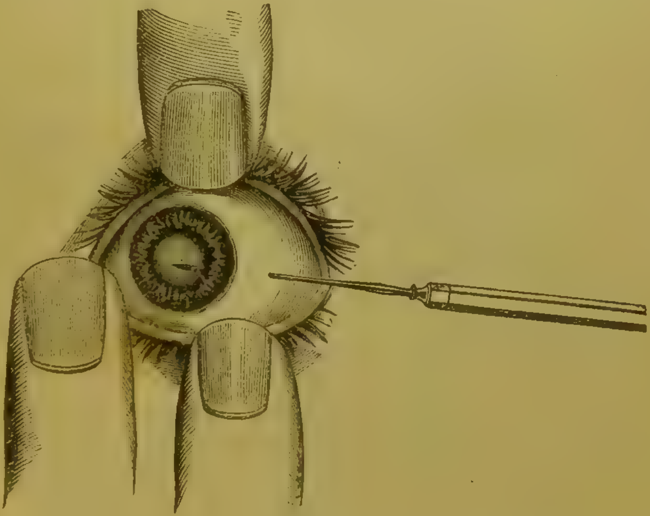

Fig. 87.

3*rd Period.* The operator proceeds by numerous touches of the instrument, to tear the anterior hemisphere of the capsule into shreds, to an extent rather exceeding than falling within the natural size of the pupil. The object is entirely to annihilate the central portion of the capsule, and thus allow the aqueous humour free access to the lens. Merely to pierce the capsule, slit it up, or tear it from the front of the lens, would, in all probability, not answer the purpose, because the portions of the capsule thus treated would speedily re-unite, and the absorption of the lens be interrupted. Neither is it desirable to open the capsule in the whole of its diameter, because this would most likely be followed by dislocation of the lens, which would consequently press against the iris, or pass entire through the pupil into the anterior chamber.

The comminution of the capsule is to be effected without exercising much pressure on the crystalline, which might cause separation of the adhesion between the ciliary processes and zonula Zinnii.

If the lens be soft and friable, portions of it, towards the end of this period of the operation, will generally be observed to break off, and float forwards through the pupil. If it be partially or entirely dissolved, the fluid will escape into the aqueous humour and render it turbid as soon as the capsule is opened.

If it be the first operation which the cataract has undergone, the needle should be withdrawn as soon as the division of the capsule is completed. It is of great importance, however, that this part of the operation be as completely executed as possible, especially in cases of congenital cataract, both that we may avoid unnecessary repetitions of the operation, and because the capsule is generally much less tough at a first operation than in any succeeding one, and therefore more easily divided. If merely punctured in a first operation, and left, in an almost entire state, to be acted on by the aqueous humour, admitted through the puncture of the capsule, this membrane is often found, on a second operation, to be much tougher and more opaque, or now for the first time opaque, having formerly been transparent. I have especially remarked this in infants. Hence the necessity of great attention to the comminution of the anterior hemisphere of the capsule at the first operation.

4*th Period.* It sometimes happens that the division of the capsule, in the manner and to the extent above stated, is sufficient, without any further operation, to procure the absorption of the lens, and the restoration of vision. Much oftener the operation of division requires to be repeated after the interval of two or three months; and at the second operation, particular attention requires to be paid to the breaking up of the lens and dispersion of its fragments.

The needle being introduced as before, the operator begins the division exactly as he began the former operation, lest the shreds of the capsule may in the interval have coalesced, and therefore require to be separated and broken down. Having assured himself of the existence of a sufficient central aperture in the capsule, he next, by gentle movements of the needle upwards and downwards, divides the lens, pushing the pieces, as he proceeds, through the pupil, into the anterior chamber. In breaking up the lens, it is sometimes necessary to move the edge of the needle backwards or towards the vitreous humour; but this direction ought rather to be avoided, in order that the posterior capsule may be left entire, for if it be much injured, it is apt to become opaque, an occurrence rendering necessary new operations, which endanger the organisation of the vitreous humour.

It is by no means essential, even for speedy solution, that the pieces of the divided lens be brought into the anterior chamber. Some have been led to think, that solution is accomplished fully as quickly, when the lens, stript of its capsule, is left in its natural situation. No doubt, the greater quantity of the menstruum by which the solution is to be effected lies in the anterior chamber, and therefore a comminuted lens will there be brought more thoroughly into contact with the aqueous humour; but, on the other hand, it is urged that probably this menstruum is secreted chiefly in the posterior chamber, and that it is possible it may possess more of the solvent power when just flowing from the capillaries which secrete it, than after it has passed forward through the pupil, and is about to be absorbed.[8]

The facility with which the fragments of the divided lens are scattered by the needle, does not depend so much on its consistence as on a sort of coagulation which it has undergone. In patients about the age of 25, we not unfrequently find the lens so soft that the needle passes through it in every direction, but at the same time so tenacious, that the fragments can be separated with difficulty; whereas in patients of 35, the lens is generally more friable, and breaks under the needle into scales and flocculi. By exposure, however, to the aqueous humour for a few weeks, the glutinous lens becomes coagulated, and then its fragments prove less cohesive. Even the hard lens of an old person, if exposed for some time to the influence of the aqueous humour, occasionally becomes brittle, so that at a second operation with the needle, (the first operation having been devoted to the comminution of the anterior hemisphere of the capsule), we find the superficial laminæ, at least, of the lens to scatter into fragments. This is an occurrence, however, too rare to vindicate us in adopting division as a general mode of operating on the hard cataract of old persons.

When instead of merely comminuting the anterior hemisphere of the capsule, or scraping down the surface of the lens, it is our object to cut the lens in pieces, an operation which is termed *discission*, we require to employ a straight needle, such as is represented in the annexed figure (*Fig.* 88.), its breadth being $\frac{1}{20}$ inch, its length from the point to the neck $\frac{1}{3}$ inch, and its neck round. Its cutting edges must be made as sharp as possible.

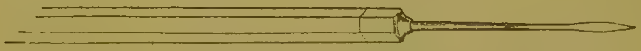

Fig. 88.

1*st Period.* The pupil being dilated by belladonna, the needle is to be passed through the sclerotica, at the distance of $\frac{1}{6}$ inch behind the edge of the cornea, in the equator of the eye, and with its one flat surface directed upwards and the other downwards.

2*nd Period.* The second period commences by giving to the instrument a quarter-turn on its axis, at the same time that its point is directed towards the interval between the ciliary processes and the circumference of the lens. Its one flat surface looking forwards, and its other flat surface backwards, it is now advanced through the posterior chamber, till its point is hid behind the nasal portion of the iris, and has advanced nearly as far as the nasal edge of the lens.

3rd Period. In the third period, one of the cutting edges of the needle being turned towards the cataract, by a steady pressure backwards, accompanied by a slight withdrawing motion of the instrument, the lens, enveloped in its capsule, is to be fairly cut across, and divided into two. Provided the capsule is not thickened and opaque, and the nucleus of the lens not firm, a moderate pressure of the needle backwards will cause it to sink through these structures, so that their division may be accomplished by pressure alone; if the capsule, on the other hand, is thickened, or the nucleus of the lens firm, mere pressure will have the effect only of carrying them back towards the vitreous humour, but not of dividing them. The combination, then, of a drawing motion across the cataract, along with pressure backwards through its substance, is necessary to accomplish the division.

Supposing the cataract to be divided into halves, the needle is now to be brought forwards through the cut it has made, in order that a similar discission may be made of the upper and lower portions of the lens and capsule. Having been divided into as many pieces as possible, the smaller portions are to be pushed with the flat side of the needle, through the pupil, into the anterior chamber.

What length of time is generally required for the cure of cataract by absorption? To this I am inclined to answer, that we have no evidence to prove that the capsule is ever absorbed, whether it be in the transparent or in the opaque state; and that as for the lens, the rapidity with which it is dissolved, depends partly on its consistence, and partly on the completeness with which it is exposed to the aqueous humour. If in a person below 35 years of age, the central portion of the anterior hemisphere of the capsule be thoroughly comminuted with the needle, and if no inflammation follow the operation, the lens may be completely dissolved in six or eight weeks. Of course, the soft lens of the child will be absorbed in a shorter time, while the hard lens of a person of 55 or 60 may remain unchanged for many months. In an individual of about 30 years of age, in whom I freely divided the anterior hemisphere of the capsule, very little absorption seemed to take place for the first six weeks. In the course of the next two weeks, the lens was completely dissolved. Dr. W. Soemmerring made a single incision into the opaque capsule of a boy, of four years of age, affected with congenital cataract. The lens remained without apparent change for half a year. Absorption then commenced, and rapidly proceeded.[9]

We constantly observe, that solution and absorption go on much more rapidly, when the eye is free from inflammation or irritation. Indeed during an attack of pain, with redness and epiphora, solution and absorption seem to cease, but are renewed whenever the irritation subsides, or the inflammation is overcome. We explain this, partly by the well-known fact, that over-distention of the blood-vessels is found to be inconsistent with a free action of the absorbents, and partly by the circumstance, that although there may be no evident effusion of lymph behind the pupil, there is always a tendency in internal ophthalmia, to such an effusion and, of course, a disposition to close up and repair the injured capsule. This effort of nature, however admirable its design, we must in this instance endeavour to counteract, in the first place, by as complete a division of the capsule as is possible, and, secondly, by a strict antiphlogistic after-treatment.

The opinion above stated, that the capsule, so far as we know, is insoluble, is, I am aware, in contradiction to what has usually been maintained upon this point. The capsule in the transparent state we never see; its shreds are invisible, from the very circumstance of their transparency. The membrane, too, is highly elastic, and upon being divided, rolls itself up like a bit of moistened gold-beater's leaf. But if inflammation occurs, the capsule becomes opaque, and, unless the inflammation is speedily subdued, will continue permanently so. The opaque shreds in the inflamed state tend also to re-unite, and thus give rise to secondary capsular cataract. Subdue the inflammation by blood-letting, mercury, and other appropriate remedies, and the opaque state of the capsule subsides or disappears. Neglect it, and not merely does the opacity become permanent, but however much the capsule may afterwards be divided, its shreds never disappear, except by displacement. They may be pushed aside, a central aperture cleared, and vision restored; but portions of opaque capsule will be visible for life behind the edge of the pupil, when brought under the influence of belladonna, and the minute shreds which fell down into the anterior chamber, will lie there without undergoing the slightest change. It is probable, that the return of transparency, after inflammation of the capsule is overcome, has given rise to the erroneous opinion that this membrane is susceptible of solution in the aqueous humour.

Modifications of division through the sclerotica, according to varieties of cataract.—1. When the lens is fluid, it will of course flow through the wound of the capsule into the aqueous humour. This renders it difficult to execute the division of the capsule with precision. It is desirable, however, that the centre of it should be freely lacerated. The turbid aqueous humour is generally absorbed in a few days, and not unfrequently in the course of a single day. As has already been mentioned (p. 784), the effusion of the dissolved lens into the aqueous chambers, is apt to excite vomiting and inflammation.

2. The appearances of the opacity, added to the age of the patient, should in general be sufficiently indicative of hard cataract; and in cases of this sort, division, and especially discission, ought not to be tried. Should the operator, however, have deceived himself, supposing the lens to be soft, but on touching it with the needle discover it to be hard, he has a choice of either performing displacement, or of bringing the lens through the pupil, opening one-third of the circumference of the cornea, and extracting.

3. In capsulo-lenticular cataract, the opaque portion of the capsule, which generally occupies the centre, may be so thick and tough, that it cannot be divided. In this case, the lens ought to be cut up, and the transparent part of the capsule divided. After the lens has dissolved, the opaque portion of the capsule may be extracted through a puncture of the cornea.

4. When the pupillary edge of the iris is partially adherent to the

capsule, (which in this case is always more or less opaque), we may endeavour with the point or edge of the needle cautiously to separate the adhesions, particularly if they are but few in number, and having effected this, proceed to the division of the capsule in the usual way. If the whole edge of the pupil is adherent, separation is scarcely to be accomplished; and the case must be treated either by drilling, or by the formation of an artificial pupil.

After-treatment.—Except in continued dilatation of the pupil, the after-treatment does not differ from what has already been recommended as advisable after the operations of displacement. If the pupil is kept under the influence of belladonna, the fragments of the divided lens are in a great measure prevented from irritating the iris, and thus iritis is warded off. It is dangerous to allow the pupil to contract, before the cataract is dissolved. The eyebrow and eyelids, therefore, are to be smeared with the extract of belladonna morning and evening, till all redness and irritation consequent to the operation have disappeared, after which we may substitute the solution of atropine, of which a little is to be dropped into the inner corner of the eye, the patient opening the lids and allowing the solution to spread over the conjunctiva. This is to be continued once a day, till the cataract has disappeared, the patient meanwhile shading the eyes, lest the influence of the light prove hurtful.

Accidents during and after division through the sclerotica.— Many of these are exactly similar to those which attend the operations of displacement, and need not again be particularly insisted on. A few are peculiar.

1. The needle, instead of entering the posterior chamber, sometimes slips between the lens and the capsule. From the transparency of the capsule, this accident may escape the operator's notice, till he has made a number of movements with the needle through the lens, and finds no flocculent substance passing into the aqueous humour. Suspecting what is wrong, he may even press the point of the needle forwards in the direction of the pupil, but in so doing, carry the capsule still entire before the instrument. As it is impossible, with the needle in this situation, to divide the capsule in a proper manner, the operator ought to withdraw the instrument a certain way, and then repeat the second period of the operation, taking care to bring the point of the needle in front of the capsule. It is bad practice to proceed to divide the lens, and leave the capsule almost untouched.

2. Should it happen, in consequence of an improper use of the needle, that the lens bursts from the capsule, and passes through the pupil into the anterior chamber, the cornea should immediately be opened, and the lens extracted. This accident is particularly apt to happen, in the operation of discission, if the cutting edge of the needle is not placed exactly in the equator of the lens. If it is either above or below it, as soon as pressure is applied, with the intention of cutting the cataract into two, the lens is tilted into the anterior chamber.

3. If we have divided the capsule in a case of hard cataract, the surface of the lens may dissolve, leaving a firm nucleus. This gradually diminishes in bulk; and it is the practice of some operators,

in cataracts of medium consistence, first to reduce the size of the lens by exposing it to the action of the aqueous humour, and then to dispose of the nucleus by displacement.[10] I have known a hard nucleus undissolved a year after the operation of division. Falling forwards into the anterior chamber, it may cause great irritation, neuralgia, and inflammation. It may become united to the iris by inflammation, so that if we delay opening the cornea for its extraction, when we come at last to do this, it cannot be removed, having become organised and incorporated with the iris.

4. If the hyaloid membrane is in a dissolved state, the lens and capsule, hitherto kept in their place by the adhesion of the zonula Zinnii to the ciliary processes, are apt, on being touched with the needle, suddenly to sink to the bottom of the vitreous humour. In this case, the cataract ought immediately to be laid hold of with the needle, brought up into its former place, pushed through the pupil, and extracted through a small section of the cornea.

5. A certain degree of inflammation may always be expected to follow division through the sclerotica. A soft lens, exposed to the aqueous humour, imbibes that fluid, swells, and sometimes presses on the iris, so as to cause pain and vomiting, and to bring on internal inflammation of the eye, leading to a contraction of the pupil. Reparative inflammation of the capsule, also, must always ensue, spreading in some degree to the iris, and, if not timely checked, producing opacity of the capsular shreds, closing up the central aperture which has been formed by the operation, interrupting in various ways the process of dissolution of the lens, and perhaps going the length of coarctation of the pupil and adhesion of the iris. In two cases in which I operated, suppuration within the capsule took place, the matter exuding partly into the anterior chamber. Belladonna, bloodletting, and calomel with opium, are the means to be employed to avert these dangers. In one of the cases just referred to, I opened the cornea, and allowed the matter to escape. The other case was greatly benefited, after the mouth became sore with mercury.

6. Has the process of solution and absorption of the lens no exhausting effects upon the internal parts of the eye? Are these parts left as sound, after this process has been accomplished, as after extraction, in neither case inflammation having occurred? To these questions I must answer, that, after the process of solution and absorption is completed, we frequently observe undeniable signs of the internal textures of the eye having suffered, not from inflammation apparently, nor from irritation, but rather from exhaustion. The nutritive, or regenerative power of the eye, appears to be weakened. The iris becomes paler and more flaccid than natural, the pupil smaller, and its motions less vivid; according to the testimony of one observer [11], the aqueous humour is insufficiently secreted; while, in some cases, the wasting of the eye extends more deeply, the vitreous humour shrinks, and the retina loses its sensibility.

§ 2. *Division through the Cornea.*

Syn.—Anterior Operation for Absorption. Keratonyxis, from *κέρας, cornu,* whence *cornea,* and *νύττω, I puncture.*

It has been conjectured that this is a very ancient method of curing cataract. It is probable, however, that the puncturing of the eye of which the Greeks spoke familiarly as a means of restoring sight[12], as well as the operation for cataract for which Galen says man was indebted to the goat, was depression through the sclerotica, not division through the cornea.[13]

Albucasis tells us[14], that he had been informed there were some who pumped out the cataract through a hollow needle. Now, in cases of fluid cataract, there is no doubt that the *gutta opaca,* in which the Arabians believed cataract to consist, might be discharged through a small cannula, introduced, I presume, through the cornea; but even when the cataract was not fluid, and when only the aqueous humour was discharged, a very slight wound through the anterior hemisphere of the capsule with the end of the tube, might occasionally effect a cure, by the admission of the aqueous humour. We shall presently see that the operation proposed by Conradi amounted to little more than such a perforation of the capsule.

There is an insulated case recorded by Mayerne, in which a female oculist appears to have cured a cataract in a young person, by the introduction of a needle through the cornea.[15] This case is generally considered as the earliest example of an attempt to procure the solution of the lens by puncturing the capsule through the cornea. It is, however, not very evident what was the intention of the operator, and, except from the circumstance of its being placed in a chapter *De Suffusione,* we should not have known that it was a case of cataract at all.

Gleize deserves to be mentioned in a history of the operation of division through the cornea, although his claims have been strangely exaggerated. It happened that a patient, on whom he was about to perform extraction, made an involuntary motion with her head, just as the knife penetrated the cornea, so that the knife slipped out, and was followed by the aqueous humour. It occurred to the operator, that he might depress the cataract through the wound of the cornea, which he accordingly did. He says nothing about dividing the cataract, or exposing it to solution in the aqueous humour.[16] His successful depression in this instance led him, however, to recommend a similar mode of operation in other cases; namely, that having dilated the pupil by belladonna, the operator should make an incision at the edge of the cornea, introduce a needle and divide the capsule circularly, depress the lens if hard, extract it if soft, but leave any fragments which might be detached from it, or even the whole lens if it could neither be depressed nor extracted, to be dissolved by the aqueous humour, an event which he says occupies 20 or 30 days, or longer.

The merit of first proposing a distinct method of operating by division through the cornea belongs to Conradi, a surgeon at Nordheim in Hanover. He at once passed a needle, or very small lancet-shaped knife, through the cornea, opened the anterior hemisphere of the capsule, and withdrew the instrument, leaving the cataract to be dissolved; an operation which is certainly one of the simplest yet proposed for the cure of this disease, being executed with a single instrument, and interesting only the cornea and the capsule.[17]

Conradi's operation was put to the test in different parts of Germany. In many cases it proved successful; in others, the punctured incision of the capsule was found to heal up, and thus the solution of the cataract to be interrupted. This led Buchhorn, of Magdeburg, to add two important steps to the operation, namely, dividing the lens as well as the capsule, and bringing forward the fragments of the cataract with the flat side of the needle.[18] The division of the lens, and the introduction of its fragments into the anterior chamber, were supposed directly to hasten the solution of the cataract and the consequent restoration of sight. The success, however, of this method depends chiefly upon the degree in which the anterior hemisphere of the capsule is comminuted. If this part of the operation be so completely effected, that the remains of the membrane cannot coalesce, then the solution of a cataract of ordinary consistence is certain, even should it be left entire, and in its natural situation.

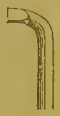

Fig. 90.

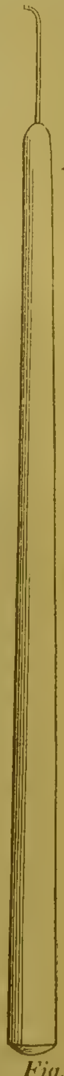

Fig. 89.

Division through the cornea, which partakes much more of the nature of laceration than discission, comprehends three periods; viz. *first*, the introduction of the needle; *secondly*, the division of the capsule; and *thirdly*, the division of the lens and scattering of its fragments.

Whatever form is given to the needle, it ought to be smaller than that used for division through the sclerotica, as in the present case it has to operate through the pupil, and often in the eyes of infants. The neck must be round, and of such a degree of thickness as shall fill the wound made by the bent part of the instrument.

I consider a modification of the needle recommended by Dr. Jacob[19] to be the best, combining the advantages of a small blade, with great strength and fine temper, inflicting so minute a wound that no mark remains in the cornea, capable of effectually opening up the texture of the lens, and, from its conical form, not likely to permit the aqueous humour to escape during the operation.

Dr. Jacob's needle (*Fig.* 89.) is made out of a common sewing needle, of the size known as No. 7, being about $\frac{1}{44}$ inch in thickness. The point is turned to the requisite curve by means of a pair of pliers, or the ward of a small key; of course without heat, which would destroy the temper. All needles are not so soft as to be bent thus cold; there may not be one in ten of this temper, but, when once turned, such a needle retains the curve without any danger of bending or breaking, and possesses a degree of strength and temper rarely observed in needles separately forged and finished by the cutler. After having received the requisite curve, the point is ground flat on each side, on a fine hone, and carefully examined with a magnifying glass to ascertain that it is perfect. (See magnified view, *Fig.* 90.) The needle, held in a pair of pliers, is now to be run down into a cedar handle, leaving only half an inch of blade. If the blade be left longer, it will yield and spring when opposed to a resistance. A needle, thus constructed, is neither more nor less than a shoemaker's square awl in miniature, and as this tool, when dexterously used, passes readily through a piece of thick dense leather, so, no doubt, will this needle penetrate the cornea, when properly handled; that is to say, when one or other angle of its edge is entered foremost. To insure, however, a ready passage through the cornea, even in the hands of those unacquainted with this manœuvre, the square edge may be changed into a single point, as is represented in the magnified view (*Fig.* 91.). Less dexterity and less force are needed to pass this form of needle through the cornea, while it tears up the capsule and lens better.

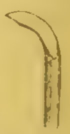

Fig. 91.

1*st Period.* The pupil being dilated by belladonna, and the patient seated on a low chair, or laid along upon a table, the surgeon stands behind him, raises the upper eyelid, and brings the point of the needle within a very short distance of the eye. When the cornea is brought into an advantageous position, and completely fixed by the fingers, he suddenly strikes the needle into it, at the distance of not less than $\frac{1}{10}$ inch from the sclerotica, directing the point of the instrument towards the centre of the pupil, and its flat side towards the iris (*Fig.* 92.). The conical form of the needle, and the resisting texture of the cornea, render necessary a considerable degree of pressure to make the instrument penetrate into the anterior chamber.

2*nd Period.* The needle having fairly entered the anterior chamber, so that its point is seen at the opposite side of the pupil, the operator turns the point directly back, and proceeds to comminute the capsule, picking and scratching the surface of the crystalline with a semi-rotatory motion of the instrument. This he should do with the needle turned first in one direction, and then in another, so as to reduce to minute fragments the central portion of the capsule, in an extent equal to the natural size of the pupil. In doing this, he takes care not to raise the capsule on the point of the needle, which, by rending the membrane across, might give rise to dislocation of the lens, and would at least prevent the division from being accomplished in a satisfactory manner.

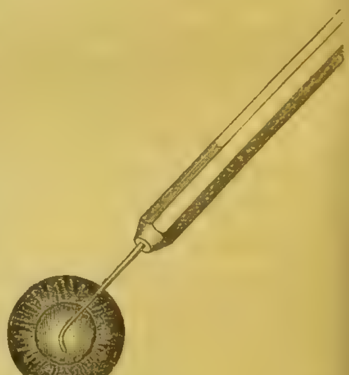

Fig. 92.

3*rd Period.* If the lens is soft and friable, fragments of it fall like snow into the anterior chamber, as the surgeon comminutes the capsule. When he observes this, he may proceed to deal more freely with the lens, twirling the needle round so as to drill away its substance. A cataractous lens is sometimes so soft, that it falls almost into a powder under the needle. In such cases, the fragments necessarily fall into the anterior chamber, so as to fill it half way up, and are rapidly absorbed without producing inflammation. Such, observes

Dr. Jacob, are certain lenticular cataracts of a blue tint, not generally found in old persons.

As the operation generally requires to be performed more than once, in the second and subsequent operations, it is the comminution of the lens which is to be chiefly attended to, unless at the first operation the formation of a sufficient central aperture in the capsule has failed. When this has been the case, the division of the capsule must be repeated, then the lens broken up, in the manner already mentioned, and the fragments brought forward into the anterior chamber. If the fragments be larger than the head of a common pin, they are liable to produce inflammation by pressing on the iris, which pressure can be obviated only by keeping the pupil completely dilated by belladonna. No rule can be given regarding the periods at which the operation should be repeated. Dr. Jacob observes, that "while the broken lens lies well in the posterior chamber, without pressing on the iris, the operator has reason to congratulate himself, and it is only when he has ascertained that no change is taking place in the cataract, that he is called upon again to disturb it. He should be particularly cautious not to repeat the operation while any trace of inflammation exists."

As in division through the sclerotica, the posterior hemisphere of the capsule and the vitreous humour ought to be spared as much as possible. In the operation through the cornea, this can be done more easily than in division through the sclerotica.

In withdrawing the needle, the surgeon has to encounter the same description of difficulty which attends its introduction. It is tightly held by the cornea, requiring to be turned on its axis in order to extract it, as an awl is drawn from leather.

The *after-treatment* is the same as when division has been performed through the sclerotica.

Modifications of division through the cornea, according to varieties of cataract.— 1. The fluid cataract is to be treated as has already been recommended (pages 781, 821) on other occasions; but the hard cataract cannot be managed so easily as if the needle had been passed through the sclerotica. Some of the German operators recommend reclination to be immediately performed when the lens proves to be hard, but I should judge it better, having carefully comminuted the capsule, to withdraw the needle, and allow the lens to be acted on by the aqueous humour. After six or eight weeks, we shall probably find the lens softened and fit for being broken up. If it does not appear so, it may be displaced through the sclerotica, or extracted through a small section of the cornea.

2. It sometimes happens that as the surgeon is comminuting the capsule, or opening up the texture of the lens, the latter falls into a number of large fragments, which come forward into the anterior chamber. These may be taken up on the point of the needle, and forced back out of the way of the iris, or if sufficiently soft, they may be divided by pressing them against the back of the cornea with the convex edge of the needle.

3. In certain cases, the pupil is found almost closed, and adhering to a small hard cataract. Dr. Jacob has introduced his needle in

such cases, and with the point destroyed the adhesions between the margin of the pupil and the hard mass, which he has then placed in the anterior chamber, and removed through an opening in the cornea.

4. The operation of terebration, already referred to (p. 817), is a variety of keratonyxis, which, though in a great measure superseded by the formation of an artificial pupil, still requires a short notice.

It was in cases of capsular or capsulo-lenticular cataract, with the pupil reduced to a small size, and adherent by its margin to the capsule, that the operation of drilling was introduced by Mr. Tyrrell.[20] Having passed a very fine straight needle through the temporal edge of the cornea, he directed its point to the capsule, close to the nasal margin of the pupil, and having penetrated the capsule, and entered the substance of the lens to the depth of about $\frac{1}{16}$ inch, he rotated the needle, so as to make its point act as a drill. Having thus secured an opening more free than could be effected by a simple puncture, he withdrew the needle.

According to the degree of supposed absorption, he repeated the operation every three, four, or five weeks, taking care to puncture the capsule in a fresh place at each operation, till at length he was enabled so far to weaken or detach the portion of capsule, occupying the pupil, that it was easily displaced, after the lens became absorbed. The extent of the loss of lens he ascertained by the increase in the size of the anterior chamber, and by the diminished resistance to the point of the needle. Upon an average, he had to repeat the operation seven or eight times, before the lens was removed. In most cases, he accomplished the clearing of the pupil, and restoration to sight, simply by repeated drilling; but, in a few instances, he was obliged, after all, to form an artificial pupil with Maunoir's scissors.

The circumstance already referred to (p. 658), and of which Mr. Tyrrell was not ignorant, that generally the lens is not opaque, in the cases in question, and that even the capsule is transparent, except within the area of the pupil, has led, in a great measure, to the abandonment of this mode of treatment, and to the substitution at once of an artificial pupil, by the removal of a portion of iris, thus both securing a passage for the rays of light on to the retina, and preserving the crystalline.

5. From the firmness of its point, and the ease with which it can be turned in every direction, the bent needle for division through the cornea sometimes enables the surgeon to deal effectually with an opaque capsule, the lens having previously been removed. He may sometimes succeed in picking it, with the point of the instrument, from any attachment it may have to the iris, or if it hangs floating, he may perhaps entangle and detach it, by pulling or twisting.

Accidents during or after division through the cornea.—1. It sometimes happens that just as the needle passes through the cornea, the dilated pupil suddenly contracts. This is not unlikely to happen if the anterior surface of the iris is touched with the needle, but it sometimes takes place before the point of the instrument is fairly within the anterior chamber. After a minute or two, the pupil generally expands again, so that the operation may be proceeded with. If it continues much contracted after some minutes, the needle must be withdrawn; and on some future day, another attempt may be made, giving the pupil every chance of keeping dilated, by both using belladonna on the day previous to the operation, and by dropping the solution of atropine on the conjunctiva about an hour before it is performed.

2. Should the eye be too much pressed upon by the fingers, or should the needle be ill adapted for filling the wound of the cornea, the aqueous humour is apt to escape, one of the consequences of which is that the iris advances towards the cornea, and folds itself round the needle, so that it is difficult, if not impossible, to proceed with the operation. In this case, the operator should either immediately withdraw the needle, or merely open the front of the capsule by a single scratch with its point, and then withdraw it, taking care to supply himself with a more cautious assistant, or with a better needle, before attempting the operation a second time. Even with the best assistance, and the best constructed needle, an escape of aqueous humour is apt to happen, and forms, from its serious consequences, a weighty objection to the operation through the cornea.

The advancement of the iris is not the only bad consequence of the loss of the aqueous humour. The lens also is apt to start forward, and sometimes even bursts from the capsule. Under these circumstances, it is immediately advisable either to displace the lens through the sclerotica, or to extract it through a small section of the cornea; for when left in this state, it presses against the pupil, and, if hard, may give rise to severe inflammation of the iris, and even of the cornea.

Even a soft cataract, in a young person, left pressing against the iris, and the latter in contact with the cornea, I have known to be followed by severe inflammation, ending in contracted and adherent pupil. In such circumstances, it may be weeks before the iris resumes its natural place, or any aqueous humour occupies the anterior chamber.

3. Dislocation of the lens occurs under various circumstances, during or after the operation.

If a hard lens be dislocated from the capsule, in consequence of the needle sticking in it, the lens may be placed in the anterior chamber, and immediately extracted.

If instead of a central aperture only having been formed in the capsule, its whole diameter has been slit open, dislocation of the lens may happen in the course of some days after the operation. The exposed lens, imbibing aqueous humour, and becoming swollen, may not only press against the iris, but become partially dislocated, coming out of the capsule by one of its edges, and projecting through the pupil. This accident is favoured by too great a dilatation of the pupil. I have seen the cornea take on ulceration, from the irritation caused by such a dislocation. The lens should be extracted, and the inflammation combated by venesection, leeches, and calomel with opium.

4. Independently of any dislocation, division through the cornea is sometimes followed by corneitis, generally attended by inflammation

of the iris. The cornea loses its lustre, and its internal surface, probably from effused lymph, sometimes becomes of a yellowish colour. The aqueous humour also assumes a turbid appearance, so that the state of the iris can be discerned with difficulty. When the inflammation subsides, and the cornea and anterior chamber become clear, the iris is observed to be retracted, the pupil irregular, and its edge adherent to the remnants of the capsule, which are of a whitish colour, forming a secondary capsular cataract. It is a very common result of division, either through the cornea or through the sclerotica, that the capsule, transparent at the time of the operation, becomes opaque, requiring to be removed out of the axis of vision by a subsequent operation. The inflammation of the cornea, iris, and capsule, must be treated by blood-letting, calomel with opium, counter-irritation, and belladonna. The attack is sometimes so acute as to require repeated venesection. In other cases, the inflammation is comparatively slight, continuing for months, and perhaps scarcely attracting attention, except from those who have been put on their guard against this chronic form of corneitis and iritis.[21] Scrofulous iritis in young persons is sometimes very troublesome after division through the cornea, and is apt to end in closure of the pupil.

If the operation of division be attempted on the eyes of old persons, arthritic ophthalmia is liable to follow, and will resist almost every method of cure. The pain of the eye and head continues unabated, notwithstanding depletion, counter-irritation, mercury, and opium. The patient gets little or no rest, day nor night. The redness is not intense; there is a very distinct bluish-white ring round the edge of the cornea; the lens becomes of a green colour, and appears swollen; and the retina is soon rendered totally insensible. In such a case, it is advisable, even as a mere means of relief from pain, to extract the lens.

5. A very singular consequence of division through the cornea has been described by Dr. Ammon[22], namely, an infiltration of fluid cataractous matter into the substance of the cornea, rendering it white and swollen, and ending in its ulceration and complete destruction. When such an infiltration takes place (which in Dr. Ammon's case it did in the course of the day on which the operation was performed), he recommends opening the cornea as in extraction.

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[1] The Germans, feeling no wish to rob Mr. Pott of his fair claims, call this *Die Potts'che Operationsmethode.*

[2] "Si subindè redit, eadem acu magis concidenda, et in plures partes dissipanda est." Celsus de Re Medicâ; Lib. vii.; Pars ii.; Cap. i.; Sect. ii.

[3] "Etiamsi sufficienter depressa haud erit cataracta, visum tamen sæpe post septimanas septem vel octo rediisse, in variis observavi, modo in partes varias divisa fuerit." Pauli Barbette Opera Chirurgico-Anatomica, p. 66; Lugd. Batav. 1672.

[4] Short but Exact Account of all the Diseases incident to the Eyes; London, 1706.

[5] Traité des Maladies de l'Œil, p. 186; Troyes, 1711.

[6] "I have sometimes, when I have found the cataract to be of the mixed kind, not attempted depression; but have contented myself with a free laceration of the capsula; and having turned the needle round and round between my finger and thumb, within the body of the crystalline, have left all the parts in their natural situation: in which cases I have hardly ever known them fail of dissolving so entirely as not to leave the smallest vestige of a cataract." Pott's Chirurgical Works; Vol. iii. p. 156; London, 1808. Mr. Pott first published his remarks on the Cataract in 1775.

[7] Practical Observations in Surgery, p. 72 ; London, 1803.

[8] De la Garde's Treatise on Cataract, p. 51 ; London, 1821.

[9] Beobachtungen über die organischen Veränderungen im Auge nach Staaroperationen, p. 58 ; Frankfurt am Main, 1828.

[10] Return of Operations in the Calcutta Eye Infirmary, by W. Martin ; Calcutta, 1853.

[11] Bouisson, Archives Générales de Médecine, Mai, 1847, p. 1.

[12] "Καὶ τὶ παραδοξότερόν ἐστιν, ἢ κεντεῖν τινι τὸν ὀφθαλμὸν, ἵνα ἴδῃ ; Epicteti Dissertationes ab Arriano collectæ ; i. 25.

[13] "Τίνα δὲ ἐκ περιπτώσεως φασὶ ἐπινενοῆσθαι ὡς τὸ παρακεντεῖν τοὺς ὑποκεχυμένους ἐκ τοῦ περιπεσεῖν αἶγα, ἥτις περιχυθεῖσα ἀνέϐλεψεν, ὀξυσχοίνου ἐμπαγείσης εἰς τὸν ὀφθαλμόν." Galeni Εἰσαγωγὴ ἢ Ἰατρὸς." Opera, Vol. iv. p. 371 ; Basileæ, 1538.

[14] Methodus Medendi, autore Albucase, p. 68 ; Basileæ, 1541.

[15] Praxeos Mayernianæ Syntagma, p. 84, Londini, 1690.

[16] Nouvelles Observations pratiques sur les Maladies de l'Œil, p. 118 ; Orleans, 1812. Either the original edition, published in 1786, contains a different account of the case referred to in the text, or Buchhorn is incorrect in stating that through the wound Gleize divided the lens and capsule, that the lens dissolved in 20 days, and that Gleize adopted this as a successful mode of operating. On the contrary, it was depression which Gleize performed in the case referred to ; and he prefers, when the cataract is soft, that it should, if possible, be extracted, "pour eviter la longueur de sa dissolution."

[17] Conradi published an account of his mode of operating, in 1797, in the 1st volume of Arnemann's Magazin für die Wundarzeneykunst.

[18] Buchhorn de Keratonyxide ; Halæ, 1806. Die Keratonyxis, eine neue gefahrlosere Methode den grauen Staar zu operiren ; Von W. H. J. Buchhorn ; Magdeburg, 1811. Buchhorn was the first who gave the name of *keratonyxis*, or *punctio corneæ*, to this method of operating.

[19] Dublin Hospital Reports ; Vol. iv. p. 214 ; Dublin, 1827.

[20] Practical Work on Diseases of the Eye ; Vol. ii. p. 464 ; London, 1840.

[21] See Schindler de Iritide chronicâ ex Ceratonyxide ; Vratislaviæ, 1819.

[22] Zeitschrift für die Ophthalmologie, Vol. i. p. 127 ; Dresden, 1830.

SECTION XIII. — CHOICE OF AN OPERATION FOR CATARACT ; INDICATIONS AND CONTRA-INDICATIONS FOR THE DIFFERENT MODES OF OPERATING.

When a case of cataract presents itself, the honest and intelligent practitioner will ask himself, Is this a case for division, or ought I to venture extraction, or ought I to content myself with displacement ? He will be guided in his answer, partly by the kind of cataract before him, the kind of eye in which the cataract exists, and the age and constitution of the patient, and partly by the degree of confidence which he has in his own powers and experience as an operator.

I hold it unnecessary, after what has been said in the foregoing sections, to discuss minutely the merits of each of the operations, but the following general remarks may not be unworthy of attention.

1. As the success of *division* depends on the solution of the fragments to which the cataract is reduced, and that within a moderate space of time, and without any injurious irritation of the eye, this method of operating is contra-indicated when the lens is hard, or the capsule greatly thickened or very tough. Such cataracts are either incapable of being divided with safety to the neighbouring parts, or, if partially broken up, are incapable of being dissolved.

It is only where the lens is throughout soft, and the capsule either transparent, or at least not greatly thickened, that we can with propriety have recourse to division. Hence it is, that in almost all cases of cataract in children and young persons, this is the operation which is to be preferred, while in old persons it rarely answers.

In the following cases, division appears to be peculiarly indicated.

1. When the one eye is blind from cataract, and in the other the disease is merely incipient. By the time that the cataract is fully formed in the second eye, the divided lens may already be dissolved in the other.

2. In weakly, timid, or irritable persons, and in those who are subject to convulsive or nervous diseases, extraction or displacement, both of which are severe in comparison to division, would be improper.

3. When the surgeon is timid, and unaccustomed to operate on the eye. The errors which such a person is likely to commit in performing extraction or displacement, may be fatal to the patient's sight, but in division he can do comparatively little harm, and if his first attempt fails to remove the cataract, the operation can be repeated.

Division must be regarded as an excellent mode of curing those varieties of cataract which are susceptible of solution; whereas if the operator employs division in cases unfit for this mode of cure, disappointment will be the result, and a false estimate will probably be formed of the merits which the operation really possesses. If we have recourse to division for the removal of the hard cataract of old people, we shall, in general, not merely waste time, but expose our patients to such evil consequences as may unfit them for deriving advantage from any other mode of operating. Nor ought it to be concealed that the cure of cataract by division, even in young subjects, not unfrequently gives rise to an atrophic state of the eye, unfavourable to a healthy resumption of its functions, an effect very uncommon after extraction. The labour of absorption necessary to remove the lens seems often to prove injurious. The vitreous humour, lacerated probably in the operation, shrinks; the iris becomes tremulous; without the formation of any adhesions, the pupil becomes contracted; and the retina loses, in a considerable measure, its sensibility. We often see eyes after extraction, almost perfect, except that they want the lens; rarely so, after division.

With regard to the comparative merits of division through the cornea or through the sclerotica, as the cornea is presumed to be nearly insensible, the former operation is supposed to be the less painful. It requires, however, more force to penetrate the cornea than the sclerotica and choroid; and the latter structures, notwithstanding their vascularity, are more tolerant of the injury inflicted in division, than the former. There is of course no danger of injuring the ciliary processes or retina when the needle passes through the cornea; the anterior hemisphere of the capsule is also certain of being more or less completely divided in this method, while the posterior is more likely to escape being destroyed than in the operation through the sclerotica, the hyaloid membrane is left entire, and the sensibility of the retina is less liable to be endangered by the violence done to the neighbouring textures. These advantages are, in some measure, counterbalanced by the danger of injuring the iris with the needle passed through the cornea, the liability of corneitis to occur after this mode of operating, the danger of iritis being brought on by the iris advancing into contact with the cornea from the loss of aqueous humour, and, should the lens unexpectedly prove hard, the difficulty of either displacing it or of bringing it forward through the pupil for extraction.

II. That *extraction* is the proper mode of removing a hard cataract, is an assertion, of the truth of which those who have had any considerable experience in the treatment of eye-diseases appear to be as firmly convinced, as they are that soft cataract may safely and satisfactorily be cured by division. The attempt to remove hard cataract by division, besides requiring repeated operations which protract the cure for many months, exposes the eye to the danger of the insoluble nucleus dropping through the pupil, so that at last the patient must submit to its displacement or extraction. When no particular contra-indication, therefore, exists to extraction, we have recourse to that operation; and there only remain for our consideration the circumstances which may forbid that operation even when the cataract is hard, and the comparative advantages of a large or small section of the cornea.

The following are some of the chief contra-indications to extraction through a semicircular incision of the cornea. They of course may be regarded so far, as indications either for extraction through a small section, or for displacement.

1. When the cornea is flat, the iris convex, the eyeball small, and deep in the orbit, the edge of the orbit prominent, or the eyelids short, so that the palpebral opening is contracted, it is difficult, or even impossible, to make a semicircular section of the cornea in the usual manner.

2. I have already (page 737) noticed the objection to extraction, founded on the presence of an arcus senilis. I do not consider it of much weight.

3. The existence of adhesions, either between the cornea and iris, or between the iris and crystalline capsule, generally debars the operation of extraction; for in the former case, it is not likely that the section could be executed without dividing the iris, while in the latter, the division of the capsule and exit of the lens are prevented.

4. If the pupil is very small (*myosis*), and even when under the influence of belladonna dilates to an inconsiderable extent, the last mentioned objection will still occur to prevent us from attempting extraction.

5. A fluid state of the vitreous humour is a very sufficient objection to the ordinary operation of extraction, which ought therefore never to be attempted unless the eyeball presents to the touch nearly its natural firmness. If soft and boggy, the vitreous fluid is deficient in quantity, and the retina unsound; but much more frequently, we encounter a dissolved state of the hyaloid membrane, attended by a superabundant quantity of vitreous fluid, and an extraordinary degree of hardness of the eyeball. In this case the cataract, clinging through the medium of the zonula Zinnii to the ciliary processes, may easily be displaced by the needle. The least touch is often sufficient to make it sink to the bottom of the eye, and even without any operation, a spontaneous displacement, or sort of natural cure of cataract, sometimes occurs, to the astonishment and delight of the patient.[1]

The restoration to sight in such cases, whether effected by the needle, or by a natural solution of the connection between the cataract and the ciliary processes, is seldom of long continuance. On looking into the eye, the cataract is seen bobbing about in the vitreous fluid, the iris, if not previously tremulous, now becomes so, and in the space of a few weeks or months the retina is found to be insensible. Once, on touching such a cataract with the needle, I observed that it separated from the ciliary circle, except towards the nose, where it continued to hang as if on a hinge. When the patient looked upwards he saw tolerably well, and could read the names above the shopdoors with facility, for in such a position of his head the cataract floated back into the vitreous fluid and left the pupil clear; but the instant he attempted to examine any object which required him to lean forward, such as reading a book lying on the table before him, he saw none, the cataract moving forward and shutting the pupil exactly like a door or lid. This patient continued for some time to show himself at the Glasgow Eye Infirmary, but at his last visit he was totally blind; the lens had separated from its hinge, the pupil was clear, the cataract floated behind the lower edge of the pupil, the iris was tremulous, the eyeball very hard, and the retina insensible. In all such cases, cataract is preceded by a glaucomatous state of the lens, in which it reflects the green rays of the incident light. When we know, then, that this appearance has preceded cataract, or when we find the eye preternaturally firm, we cannot proceed with confidence to extract in the usual way. Perhaps, we ought to extract through a small section, as the only mode of operating which is safe and proper under such circumstances.

6. When the eyes are exceedingly restless, affected perhaps with involuntary, incontrollable, or convulsive motions, or when the patient is under the influence of excessive fear, or exhibits an extreme want of docility, extraction is out of the question. Previously to the general use of ether or chloroform as anæsthetic agents, it sometimes happened, under circumstances such as these, that even displacement was, with great difficulty, effected. Thus in Mr. Wardrop's first attempt to operate on James Mitchell, a blind and deaf boy, then about 15 years of age, the patient at first yielded readily, and allowed himself to be placed and held on the table. The uneasiness, however, occasioned by the pressure necessary to keep the eyeball steady, and the lids open, seemed to overcome his resolution, and his exertions became so violent that it was quite impossible to secure even his head. A second attempt was made the day following, more precautions being taken to secure him; but so violent were his exertions and cries, and so irascible did he become, that all present were glad to relinquish their posts. Some days after, a wooden box, the sides of which moved on hinges, was folded round his body, and fixed by circular ropes; and in this way, notwithstanding a powerful resistance, he was placed on a table and kept quite steady. Mr. Wardrop had given up all hopes of extracting the cataract, and determined to try couching. Much difficulty was found in holding open the lids, and keeping the globe of the eye steady. As soon, however, as the needle touched the eye, he remained quite still, and

his dreadful screaming ceased. With the sharp edge of the instrument, Mr. Wardrop cut through the anterior portion of the capsule, and with its point dragged the lens from behind the pupil. On depressing the point of the needle, the lens remained out of view, except a small portion of its inferior edge. On the fourth day after the operation, the lens was found to have changed its place, and could be again distinguished covering about one-fourth of the upper edge of the pupil.[2] Such a patient could now be very easily managed, by making him inhale the vapour of ether or chloroform. The more violent the struggles of children, the more speedily do these agents take effect.

III. With regard to the comparative merits of a *large* or *small section of the cornea*, it must be acknowledged, that while no operation disturbs the internal textures of the eye less at the moment of performance than dexterously executed extraction through a semicircular incision, the dangers to which the safety of the eye is exposed, after the operation is finished, are of the most serious description. Extraction through a small section, on the other hand, causes more disturbance within the eye at the moment of operation, but is presumed to expose the organ to less risk after the cataract is removed. Extraction through a small section, although it requires fully as much caution, demands less dexterity than extraction through a semicircular section, endangers the iris less, is rarely followed by any considerable ejection of vitreous humour, or protrusion of the iris, and cannot produce so deforming or so mischievous a cicatrice, unless violent and disorganizing inflammation supervene. Fragments of the lens are apt to be left behind, and the lining membrane of the cornea is sometimes excited to inflammation, especially when the operation has been clumsily done; but there is no denying, that, after extraction through a small section, the operator sends his patient to bed with feelings of considerably less apprehension for the coming result, than after extraction through a semicircular incision.

IV. The principle on which the operations of *displacement* are founded is essentially bad. As well might we expect to lodge an entirely foreign body within the eye, and yet no continued irritation take place, no disorganization follow of the delicate textures with which it remained in contact, and no interruption happen to the function of the organ, as that the lens could be pressed into the vitreous humour, and lie there close to the retina, and the eye continue healthy, and vision be preserved. Reclination or depression is to be thought of only when some insuperable objections exist to division and extraction. I assign them this low rank in the scale, not because the lens is apt to re-ascend after being displaced, for that I consider as rather a favourable event, from the chance it gives of the cataract dissolving after its re-ascension, but because chronic inflammation within the eye, dissolution of the hyaloid membrane, and amaurosis, are, I believe, the almost invariable results of a cataract of any considerable bulk continuing undissolved in the situation assigned to it by displacement.

As to the choice between depression and reclination, small cataracts should be depressed, large ones reclined.

[1] "Dominus Packer passus est in oculo sinistro cataractam confirmatissimam ad minus per annos 23, quam albissimam, satis compactam et maturam acu deturbandam sæpiùs suasi; unâ nocte, sine ulla causa externa, evanuit suffusio, et, licet confusè, mane cœpit et lucem aspicere et colores agnoscere. Venit ad me, et oculum ostendit purum, lucidum sine ulla humorum perturbatione, obscuritate, aut confusione. Pupilla minor tantùm fuit, quæ tamen clauso altero oculo dilatabatur. Non credo fuisse dissipatum istud coagulum, sed pondere forsan ab uvea divulsam fundum petiisse aquei humoris eo loci ubi ab acu separata cataracta deprimitur et subsidit. Forsan ascendet denuò, ut sæpe contingit in cataractis malè depressis et locatis ab operatore, nisi forsan substantia crassior et gravis elevationem impediat.

"Elapsis diebus 15, ad me rediit, ostendit oculum clariorem, et facilè de omnibus objectis visibilibus potuit pronunciare. Dixit tamen uxorem aliquoties vidisse partem cataractæ denuo ascendentem ad pupillam, quæ validâ narium emunctione illico ima iterum petiit. Proculdubio recurret, neque enim absumi potest."—Praxeos Mayernianæ Syntagma, p. 83; Londini, 1690.

See Case by Boyer, Traité des Maladies Chirurgicales; Tome v. p. 509, Paris, 1816.

[2] Wardrop's Hist. of James Mitchell, pp. 27, 32; London, 1813. From the expressions employed by Mr. Wardrop, one is led to suppose that the cataract had been pressed upwards, not downwards, in the operation.

SECTION XIV.—CONGENITAL CATARACT.

Fig. Wardrop, Pl. XI. *figs.* 1, 2. Ammon, Thl. III. Taf. XIV. *figs.* 1—17. Dalrymple, Pl. XXVIII. *fig.* 1. Sichel, Pl. XVIII. *figs.* 1, 2, 4.

On the subject of congenital cataract, I must refer the reader to what I have already said, respecting the origin of the disease as an arrest of development; its being often lenticular at first, afterwards to become capsulo-lenticular; its being sometimes central; sometimes siliculose, with the lens almost entirely absorbed; its occasional complication with oscillation, amaurosis, and other defects; and the advantages of an early removal of the disease by operation. (See pages 746, 755, 756, 757, 769.)[1]

Diagnosis.— With respect to the diagnosis, I may mention that congenital cataract not unfrequently passes undetected till the subject of it has reached the age of ten or twelve, or even a more advanced period of life, the defective vision being, all the while, ascribed to myopia. This is particularly apt to happen when the cataract is of a light bluish-white colour, when the lens is either small in size and surrounded by a dark zone (p. 757), or when the margin of the lens is partially or entirely transparent (p. 755). In such cases, a considerable share of vision is obtained, especially of near objects, when the patient turns his back to the light; and it is sometimes only after artificial dilatation of the pupil, that the nature of the affection becomes manifest to the parents, or even to the practitioner.

Operation. —It is of great advantage to place the child under the influence of chloroform, when we are about to operate for congenital cataract. The absence of resistance enables us to accomplish the operation deliberately, while the restlessness of the eye is overcome more completely and more safely than can be effected by the pressure of the fingers, or the application of the speculum. Division through the cornea can then be performed with less risk of a loss of the aqueous humour; and we avoid, by having recourse to the anterior operation, the difficulties experienced in operating through the sclerotica in infants, arising from the smallness of the space between the edge of the cornea and the external commissure of the eyelids, and from the resistance offered to the needle by the loose conjunctiva, thrown into a state of protrusion, in consequence of the lids becoming everted, in the attempt to expose the eye.

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[1] On Congenital Cataract, consult Ammon's Darstellungen, Theil iii. p. 63; Berlin, 1841.

SECTION XV.—SECONDARY CATARACT.

Fig. Saunders, Pl. VI. *figs.* 1—4. Pl. VII. *figs.* 2—6. Wardrop, Pl. XIII. *fig* 5. Soemmerring's Beobachtungen. Ammon, Thl. I. Taf. XII. *figs.* 30—35. Taf. XIII. Dalrymple, Pl. XXVII. *fig.* 4. Sichel, Pl. XXI. XXII.

Secondary cataract consists either in some portion of the cataract which had existed previously to an operation, but which has been but imperfectly removed by it, or in some new production which first began to exist after an operation. Secondary cataract may be true, or spurious, or mixed. It may be a piece of lens, a piece of capsule, a lymphatic effusion, or a combination of these.

§ 1. *Lenticular Secondary Cataract.*

With regard to lenticular fragments remaining behind the pupil after any of the operations for cataract, if productive of no apparent irritation, it is the best practice to keep the pupil dilated, and wait for some time, so as to give them a chance of being dissolved by the aqueous humour. I am led to think, that occasionally a thin layer of lenticular substance is left adherent to the inside of the capsule after extraction, and that this layer, so thin and transparent as not to be observed at the moment of operation, may become quite opaque, and form an obstacle to vision after the wound is healed; but as it gradually dissolves, the pupil clears.

Sometimes a large nucleus or even an entire lens, which has reascended, may be allowed to remain, and will gradually be removed by absorption. In the meantime, external causes of irritation are to be carefully guarded against, and the pupil kept dilated by belladonna. Should solution not take place within a reasonable space of time, we have our choice either to extract through a small section, or again to displace.

Attempts to cure hard cataract by absorption are apt to be followed by persistence of the nucleus, which, in various ways, may prove a source of annoyance and danger. 1. Remaining, perhaps for years, behind the pupil it may move about as the head moves, rendering vision obscure and confused, but not producing much irritation. 2. It may sink down behind the iris, and, coming into contact with the ciliary processes, cause pain and inflammation. Effusion of lymph taking place around it, it may become bound down in its new situation. The irritation it produced may now cease; or it may continue, bringing on lymphatic deposition into the pupil, and even abscess of the cornea. 3. It may drop through the pupil, and down into the angle between the cornea and the iris, producing severe neuralgia in some cases, and in others iritis. If it is left there for some weeks or months, on proceeding to extract it, it may be found organically adherent to the iris and cornea.

In the first of these three cases, the nucleus may be displaced; but in the last two, extraction through a small section should be attempted. A curved needle is passed through the sclerotica, with which the nucleus is fixed against the cornea till the incision is made, and then the nucleus is thrust out of the eye with the needle.

§ 2. *Capsular Secondary Cataract.*

Although the capsule is seldom removed from the axis of vision along with the lens, capsular secondary cataract rarely follows the operation of displacement; but after extraction, and still more after division, this sort of secondary cataract is very common.

If the anterior hemisphere of the capsule has been somewhat opaque before extraction was performed, and the operator has not removed the opaque membrane when he extracted the lens, or if with a transparent capsule the second period of the operation has been carelessly performed, and any considerable degree of internal inflammation supervenes, capsular secondary cataract will certainly occur, and may be so complete and dense, as in a great measure to defeat the object of the operation. A slight opacity of the torn capsule is a very frequent event after extraction. Indeed it rarely happens after the patient has recovered, that on concentrating the light by means of a lens, and allowing its focus to fall on the pupil, some opaque shreds are not visible. Even when these have occupied the whole field of the pupil, I have seen the opacity so thin, that the patient could see to read and write through it, with the aid of a cataract-glass. If iritis occurs after the operation, the remnants of the capsule not only become white, and coalesce, but they adhere to the iris, the pupil becomes small and angular, and although immediately after the exit of the lens, the patient distinguished objects with tolerable precision, probably a mere perception of light and shade will now be retained.

It is difficult to prevent the formation of capsular secondary cataract after division. If the anterior half of the capsule be merely rent across by the needle, or stript in one piece from the front of the lens, it is very apt to heal up again and to become opaque, so that it both prevents the process of solution from going on, and forms of itself a new obstacle to vision. If, in performing division, the lens and capsule be separated from their natural connections, and fall back into the vitreous humour, the lens may dissolve, provided the capsule is sufficiently lacerated, but the capsule itself will probably be seen, deep in the eye, floating about, and interrupting distinct vision.

In the normal state, and even after it has become opaque, the capsule is of less specific gravity than the aqueous humour or the vitreous fluid, and hence it tends always to float up into the pupil, a fact which should be borne in mind, as well in the ordinary operation of division, as in attempts to displace a capsular secondary cataract. A piece of much thickened capsule, if completely insulated, will sink, but if still connected with a considerable portion which is not thickened, the whole will float. Hence the propriety of dividing the capsule rather from below than from above, in order that, if any shreds remain in connection with the circumference of the capsule, they may be attached near its upper rather than its lower edge, and thus float out of the axis of vision.

It is proper to try whether we cannot form a sufficient central aperture with the needle, when a capsular secondary cataract occupies a great portion of the field of the pupil. We often succeed in doing so, and find that the shreds into which we tear the obstructing membrane retreat behind the iris. But in many cases, the capsule resists this mode of treatment.

In the transparent state, the capsule is easily torn through, but it is otherwise after it has become opaque and thickened by inflammation. In this state it is so tough and elastic, that we cannot divide it; we may carry it on the point of the needle almost to the bottom of the vitreous humour, whence it instantly springs up again to its former situation. It may sometimes be gathered round the curved needle, separated from its connections, and depressed; but it seldom remains long in its new situation. I have sometimes succeeded in twisting a capsular secondary cataract round a curved needle, by rotating the needle, and then, drawing the capsule towards the aperture in the sclerotica, have left it fixed there, as I withdrew the needle. The iris and ciliary body, to which the capsular secondary cataract is often attached, are liable under such attempts to be stretched and injured, and sometimes the iris is detached from the choroid. Serious inflammation is also prone to follow such operations.

Mr. Bowman has proposed[1] to clear the pupil of capsular secondary cataract, by tearing the membrane through with two cataract needles used simultaneously. He introduces them near the opposite edges of the cornea down to the membrane; and their points, having penetrated close to one another, are then separated, tearing it across, and carrying it in fragments to opposite sides of the pupil. Thus, there is no drag upon the vascular parts, the only tissues touched being the cornea and the opaque membrane itself. One of the needles may be made to furnish a fixed point of resistance, from which the other can act with advantage.

Capsular secondary cataract may be extracted in Freytag's method, through the sclerotica, as I have already (p. 814) explained; but the safer and more satisfactory mode is through a small section of the cornea, as described at page 810. In this way, I succeeded on one occasion in removing the whole capsule (Plate II. fig. 1.), forming an entire bag, the centre of the anterior hemisphere being thickened and almost cartilaginous, while the rest of the capsule was transparent. The lens had been removed some years before by absorption.[2]

The minute instruments which recent ingenuity has introduced into ophthalmic practice under the names of cannula-forceps, and cannula-scissors, may often be used with good effect, in detaching and extracting capsular secondary cataracts, especially through the cornea.

The idea of converting the end of a bit of steel wire, no thicker than a cataract needle, into a pair of forceps, the blades of which are to open by their own elasticity, and to be shut by means of a cannula pressed forwards on the wire, belongs, it seems, to M. Charrière, a well-known surgical instrument-maker in Paris. To Mr. Wilde, of Dublin, we owe the adaptation of the same mechanism to the working of a minute pair of shears or scissors. The same handle and cannula serve for either instrument; and the surgeon may provide himself with forceps and scissors of various sorts, which he can introduce into the cannula and handle at pleasure. *Figure* 94. shows the cannula-scissors complete, and the scissors open; *Fig.* 95. the scissors closed; *Fig.* 96. the stem of the forceps, removed from the cannula; *Fig.* 97. the forceps closed.

When the surgeon is about to prepare either instrument for use, he passes the stem of the forceps or the scissors down the cannula, till the blades begin to be closed by its pressure; he then fixes the stem by turning the screw on the side of the handle. Either instrument, when about to be passed into the eye, is to be shut, which is done by pressing down the trigger to the handle; the trigger projects the cannula forwards through the collar, and thus brings the blades together. On allowing the trigger to rise, the cannula is brought back into its former position, and the blades are allowed to divaricate. If it is the forceps which are being used, the membrane within the eye, be it iris or capsule, is seized, by again pressing down the trigger and closing the blades. Keeping them so, the membrane is drawn out through the wound of the sclerotica or cornea. If it is the scissors which are being used, by pressing down the trigger the membrane is clipped, and the incision of it to the required extent is effected by repeated movements of the same sort.

The two instruments are employed chiefly in the extraction of capsular secondary cataracts, either through the cornea or through the sclerotica; and in the formation of artificial pupil, chiefly through the cornea. The scissors are used to cut across bands of tough opaque capsule or false membrane, in the one case, and in the other, to incise the iris. The forceps are used to take hold of the capsule, and withdraw it from the eye; or to lay hold of the iris, and either detach it from the choroid, or prolapse its pupillary margin through an incision of the cornea.

The common cannula-forceps (*Fig.* 96.) are formed so that the one blade ends in a single tooth, which is received, when the instrument is made to close, between two teeth in the opposite blade; and when shut (*Fig.* 97.), they form an obtuse point, so that they cannot be passed into the eye without a previous puncture. One of the blades of another pair, long and sharp-pointed, is perforated to receive the tooth of the short blade, and is sufficiently keen to enter the cornea or the sclerotica without any preliminary incision.

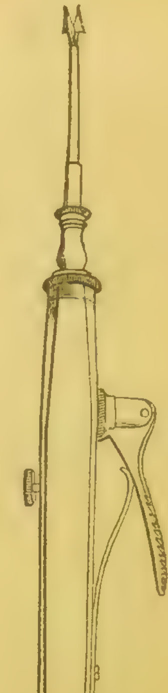
Fig. 94.

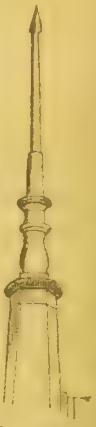
Fig. 95.

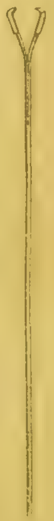
Fig. 96.

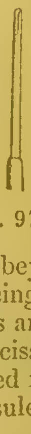
Fig. 97.

The blades of the common cannula-scissors are pointed, the one projecting beyond the other, and their external edges sharp, so that they are capable of piercing the cornea or sclerotica in the closed state (*Fig.* 95.). The cannula and scissors are so adapted to each other, that the cannula quite fills up the wound made by the scissors; so that if the cornea be the part penetrated, the aqueous humour is prevented from escaping, while the scissors are at work within, clipping the iris or the capsule, by the opening and shutting of their blades.

Mr. Bowman, to adapt the scissors for snipping the border of the pupil at a given point, without risking the lens, has had the short blade made blunt instead of sharp-pointed, so that it might be passed behind the iris, and not wound the capsule if it touched it. In conical cornea, as a plan attended with less risk than Mr. Tyrrell's operation for extending the pupil by prolapsus (see p. 689), Mr. B. proposes to pass such modified cannula-scissors at once through the cornea, and incise the pupillary border at such a point as to enlarge the pupil by the resulting gaping of the incision, behind a part of the cornea more fitted to transmit a true refraction than the apex of the cone.

It is well to be provided with different pairs of scissors; one with the blades long, another with them short; one with both blades sharp-pointed, another with the one blade sharp and the other blunt-pointed, and a third with both blades blunt-pointed.

Great nicety is required in the workmanship both of the cannula-forceps and scissors; especially of the scissors, which are meant to be self-penetrating. Unless their blades be thin, and the cannula accurately adjusted to the size of the wound which the blades make, the instrument will not only not answer, but is likely to inflict severe injury on the eye.

Each time the forceps or scissors is used, the instrument requires to be taken to pieces and carefully wiped dry, the cannula by means of threads drawn through it by a fine twisted wire; for if the least moisture is left, the stem rusts in the cannula, and the mechanism is at once disarranged. After being wiped, the forceps or scissors may be drawn through leather smeared with tallow or suet.[3]

§ 3. *Spurious Secondary Cataract.*

As for spurious secondary cataract, that which arises from the effusion of coagulable lymph, in consequence of iritis, is the most frequent. It may be very slight, fringing merely one edge of the pupil, impeding its motions on that side, giving rise to a sensation similar to what is styled a *musca volitans*, but not otherwise affecting vision. It may, on the other hand, appear very considerable, forming a net-work occupying the whole pupil, as is represented, after extraction, in *Figure* 98.; or the pupil may be much contracted, perhaps almost closed, and adherent to the remains of the capsule.

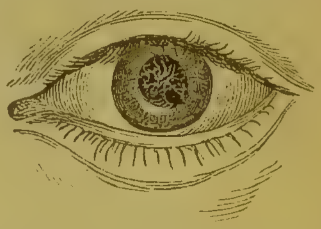

Fig. 98. (From Beer.)

The reticulated variety is generally of a very delicate texture, especially when it originates, as was the case in the instance represented in *Fig.* 98., in a sanguineous effusion, so that if we attempt to extract it, it gives way when touched with the knife passed through the cornea, or is ruptured in consequence of the loss of the aqueous humour.[4] It is, therefore, advisable to try to break it up with the needle, rather than attempt its extraction. When the pupil is much contracted, and filled by lymphatic exudation which firmly connects it to the capsule, the only method of restoring vision is to form an artificial pupil, in one or other of the ways hereafter to be described.

§ 4. *Mixed Secondary Cataract.*

A great proportion of the cases of secondary cataract which present themselves, is of this class. Opaque capsule is generally combined with some degree of false membrane, binding it more or less to the iris. Even a piece of hard lens, remaining after an operation or repeated operations with the needle, often proves intimately connected to a portion of capsule, and this attached by false membrane to the iris.

By far the most effectual mode of clearing the pupil in such cases is extraction, either through the sclerotica or through the cornea. For this purpose, the pupil should be dilated to the utmost by belladonna, the patient laid supine, and brought under the influence of chloroform.

Through the sclerotica, the operation is generally commenced by the introduction of the curved needle, and an attempt made to break open a large central aperture in the secondary cataract. If this succeeds, the fragments of the capsule shrink immediately towards or behind the iris, leaving sufficient space for good vision, and the needle is withdrawn. If the texture is tough, so that the needle makes no impression on it, an attempt is immediately to be made with the needle to gather the cataract into a mass, and to detach it from the vitreous body and from the iris. This being accomplished, the punctured wound of the sclerotica must be enlarged a little with the iris-knife, or the point of the extraction-knife. Schlagintweit's hook or the blunt-pointed cannula-forceps is introduced, the cataract is seized, the instrument is turned once or twice round on its axis to make sure of the complete separation of the cataract, which is then slowly extracted.

Through the cornea, if the cataract appears a thin pellicle, the sharp-pointed forceps may be used. Held with the short blade anterior, this instrument is carried through the cornea near its margin, and on to the edge of the pupil. The blades are opened, the sharp one passed through and behind the cataract, the short one in front. The cataract being seized by closing the blades, the instrument is rotated so as to separate any adhesions, and the extraction is effected. If the capsule appears much thickened, it is in vain to attempt its extraction through so small a puncture as that made by the sharp-pointed forceps. With the iris-knife, a wound about a line in length is made through the cornea near its margin, and at the same time the point of the instrument is passed into the cataract close to the edge of the pupil. The instrument is then suddenly withdrawn, so as to save as much as possible of the aqueous humour. The blunt-pointed forceps is introduced into the anterior chamber, the blades are opened, one of them is passed into the aperture already made in the cataract, and carried behind it, while the other blade embraces it in front, the instrument is closed, rotated, and removed along with the opaque substance. If it is the nucleus of the lens, which requires to be removed, the incision of the cornea will require to be more considerable; in which case the aqueous humour is in a great measure evacuated, and, as it flows out, is generally followed by an advance of the cataract towards the cornea.

The extraction of membranous cataracts through the cornea, was accomplished by Gibson with a simple hook, or with a pair of small forceps, which shut by a spring. The closing of the cannula-forceps requires the trigger to be pressed down, which renders it inconvenient to rotate the instrument, the fingers not being sufficiently at liberty for that purpose.

The cannula-scissors may be used, either through the sclerotica or the cornea, for cutting across the capsule, or the false membrane by which it is connected to the iris. If this is effected where the opaque pellicle is firmest, so as to leave it attached only at one point, and by a slender thread, a great object is gained. If it does not immediately shrink out of the field of the pupil, an attempt must be made to lay hold of it with the cannula-forceps, and extract it.

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[1] Medical Times and Gazette, Oct. 30, 1852, p. 438.

[2] See Gibson's Practical Observations on the Formation of an Artificial Pupil, &c., p. 117; London, 1811.

[3] Desmarres, Annales d'Oculistique; Tome xxvi. p. 166; Bruxelles, 1851: Wilde, Medical Times, December 7, 1850, p. 592: Bowman, Medical Times and Gazette, January 10, and 31, 1852, pp. 34. 108.

[4] Gibson, Op. cit., p. 126.

SECTION XVI.—CATARACT GLASSES.

The crystalline lens diminishes a little the image on the retina, but so little, that the cataract patient, after a successful operation, and before using glasses, does not complain of seeing objects larger, only dimmer than he did, before becoming affected with cataract. As, after the cataract is removed by operation, its place is filled up by aqueous fluid, the loss of the crystalline produces only a slight diminution in the refractive power of the eye, but affects much more the faculty which this organ possesses in the natural state, of accommodating itself to the different distances of objects. We endeavour to compensate for the diminished refraction, and the lost power of accommodation, by the use of double-convex or plano-convex glasses, or menisci, of different foci. The nearer the object to be viewed, the more convex the lens to be used, or in other words, the shorter its focus. An infinite number of lenses, of different focal lengths, would be necessary to make the patient see perfectly at all distances; but as this is practically out of the question, he generally contents himself with two, one for reading and seeing near objects, and the other for viewing things at a distance. Objects at his feet, such as the steps of a stair, are, therefore, what he sees worst. The lenses generally employed are of the focus of 2½ inches for reading, and of 4½ inches for distant objects. I have known individuals of 50 years of age read with 3 inch, and see distant objects very distinctly with 5 inch, glasses. Of course, glasses of the longest focus, which answer the purpose, are to be preferred; shorter ones may be necessary as life advances. Menisci are preferable, in so far as they allow a greater range of vision. Small oval lenses, surrounded by a dark border of tortoiseshell, are to be preferred, as lighter and productive of less glare, than large circular lenses, inserted immediately into the spectacle frame.

The glasses are employed for the purpose of rendering the vision of those who have been operated on for cataract, *perfect* as well as *distinct;* for there is a distinction, perhaps not a very accurately expressed one, admitted by optical authors, between *distinct* and *perfect* vision. Cataract patients after operation often possess the former without the aid of glasses, but never the latter. From want of the crystalline, the rays of the luminous pencils, which diverge from visible objects, are no longer collected to absolute points of the retina, as in the perfect eye, yet these pencils occupy portions of the retina so small, as to allow such persons to discern objects placed at a certain distance with tolerable clearness. Even at other distances than that at which they see best, they still discern objects, being enabled to do this chiefly from the changes which take place in the size of the pupil, according as the object viewed is more or less distant; but they are totally deprived of the control over the refractive powers by which the eye, in the normal state, is enabled to see perfectly at all distances, and which depends either on a change of place in the lens, a change in its figure, or both, or on other changes along with these, sufficient to shorten the focal length of the refractive media of the eye when near objects are regarded. From inattention to the above distinction, several authors have fallen into the error, of supposing that the eye retained the power of changing its focal distance, after being deprived of the crystalline lens.

Not only do patients who have been operated on for cataract see, with various degrees of distinctness, and at very different distances, without the aid of any glass, or with one glass only for all distances, the changes in the size of the pupil assisting them much in doing so, but their sight is capable, by exercise, of very considerable improvement.

Haller mentions[1] the case of a nobleman who appears, immediately after the cataract was removed from the axis of vision, to have seen distinctly at various distances. Miss H. a young lady of about 20, whose vision Dr. Young examined, used, for distant objects, a glass of 4½ inches' focus, and with this she could read as far off as 12 inches, and as near as 5. Hanson, a carpenter, aged 63, who had had a cataract extracted a few years before, and was also examined by Dr. Young, saw well to work with a lens of 2⅝ inches' focus, and could read at 8 and at 15 inches, but most conveniently at 11. Mrs. Maberly, aged about 30, who had had both lenses extracted, walked without glasses, and, with the assistance of a lens of about 4 inches' focus could read and work with ease.[2] M. Gabriel, cured of cataract by division under the care of Maunoir, read a book printed in a very small type with the aid of the same glass with which he viewed the pictures hung round a room; engaged in the chase; and won a prize at shooting, the distance being 200 paces.[3] A boy of 12 years of age, operated on by Dr. Rainy at the Glasgow Eye Infirmary, saw distant objects distinctly, and read easily with glasses of 4½ inches' focus. Mr. W. J., aged 60, upon whom I operated by extraction, wrote without glasses and read what he had written, but required glasses of 2½ inches' focus to read a printed book. Mr. T. S. T., a patient of mine, whose left lens was absorbed in consequence of an injury, read with a 5-inch glass, at from 10 to 27 inches, but best at from 17 to 20; and with a 4-inch glass, at from 8 to 18 inches, but best at from 12 to 14.

The following is a good example of the capability for improvement which the eye possesses after removal of the crystalline lens:—

Case 652. — Sir W. Adams operated on a postillion who had been blind nine years in one eye, and three in the other. Both cataracts were removed by division; and when the patient resumed his employment as a postillion, he was from necessity obliged to wear spectacles, not being able even to walk without them; but finding that his passengers were frequently apprehensive of their safety, from being driven by a person requiring spectacles, he by degrees left them off altogether in the day; and in the course of twelve months could drive quite as well without as with them.[4]

In such instances of distinct and improving vision after the removal of the crystalline lens, Dr. Young has shown that the use of the *optometer* at once demonstrates that perfect vision is wanting, or in other words, that the eye has lost all internal control over its refractive powers.[5]

The too hasty employment of cataract-glasses after the most successful operation, may soon bring the eye to a state of weakness, which will render it unfit even for those employments which require but a moderate degree of sight. No cataract-glasses ought to be given to a patient so long as his vision appears to be improving without their use. This generally continues to be the case for several months after the operation. If we allow our patient to use cataract-glasses during this period, he will no doubt be very glad to find that he can return immediately to almost all his ordinary pursuits; but he will soon begin to observe that he does not see so well as he did, and this he will probably remedy by a new pair of glasses of greater convexity, and consequently of greater magnifying power, than those he had at first. He will go on in this way, changing his glasses as his power of vision becomes less, till at last he ends in finding none which enable him to see so well as he did with those which he first used. On the other hand, if our patient does not begin to try cataract-glasses till he has completely recovered from the operation, and the eye has as much as possible habituated itself to the absence of the crystalline lens, if he then select proper glasses, and use them for a while only occasionally, his sight will still continue to improve, and his first glasses will probably, if he be an old man, serve him all his life, and if he be a man of 30 or 40, he will not require to change them till he be 50 or 60. He will be able to return to the finest kind of work in which he had been employed, such as drawing, or, if the person be a female, to sewing and the like.

The operative means for the cure of cataract may have perfectly succeeded, but from want of proper glasses the patient may derive but a small amount of benefit. Thus, the widow of Drelincourt was operated on by depression by Rau, but for fifteen or sixteen years she derived comparatively little advantage from the operation, till Haller told her to look through a small glass globe, or very thick lens, when she found that she was able to read.[6]

The best test of a cataract-glass is, that, when placed immediately in front of the eye, it enables the person to see objects perfectly, at that distance at which he could see them before he became affected with cataract. If he chooses glasses of too long a focus,—for example, of five inches' focus instead of four, and three instead of two and a half,—he will by and by discover that he sees ill with such glasses, unless he moves them an inch or two forward from his eyes, when he finds that they enable him to see distinctly. In this case, he must be furnished with glasses of shorter focus than those he had at first selected, so that the images of objects may be formed exactly on the retina. If cataract-glasses of too short a focus have been chosen, they will bring the object too near, so that the patient will be apt to mistake the distance at which it is placed from him, and on trying to grasp it, his hand will fall short of it. When this is the case, glasses of longer focus must be selected. If the pupil of the eye which has been operated on still remains dilated by belladonna, the patient will fall into the error of choosing a glass of shorter focus, than what will suffice, after the pupil has contracted to its natural size.

It is said, that those who have been short-sighted previously to the formation of cataract can, after a successful operation, lay aside their concave glasses, without having occasion for any convex ones; and that some require even concave glasses after the operation for cataract, but less concave, of course, than those which they formerly used. But such statements are probably incorrect. Having operated by extraction on a man all his life short-sighted, I found that for the vision of distant objects he required the usual glasses of four and a half inches' focus. Mrs. N., whom I cured of cataract by division, and who had been originally short-sighted, read with a 2½, but saw distant objects best with a 10-inch glass.

If a patient from whose eye a cataract has been successfully removed, had been originally a little short-sighted, but never used a concave glass, on supplying him with a convex glass after the operation, he will sometimes mention that he sees objects much more beautifully than they ever appeared to him before. In fact, he had never seen objects with the distinctness and brilliancy with which they appear to an ordinary eye, or to a myopic eye armed with a concave glass.

Short-sighted persons, before becoming affected with cataract having been able to read at perhaps 18 inches with the aid of concave glasses, after being successfully operated on for cataract, expect probably to be able again to read at that distance, a convenient one for clergymen and others; but this they cannot accomplish. Their convex glasses will enable them to read only at the distance at which they could read without concave glasses, before they became cataractous, say 6 inches.

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[1] Elementa Physiologiæ; Tom. v. Lib. xvi. Sect. iv. § 25. p. 514; Lausannæ, 1763.

[2] On the Mechanism of the Eye, by Thomas Young, M.D.; Philosophical Transactions for 1801, p. 65.

[3] Annales des Sciences Naturelles, Seconde Série, Tome v. p. 190; Paris, 1836.

[4] Journal of Science and the Arts; Vol. ii. p. 409; London, 1817.

[5] Porterfield's Treatise on the Eye, Vol. i. p. 434; Edinburgh, 1759: Young, Op. cit.

[6] Boerhaave, Prælectiones Academicæ; Tom. vi. p. 145; Venetiis, 1751.

CHAPTER XXI.

ARTIFICIAL PUPIL.

SECTION I. — INTRODUCTORY VIEW OF THE METHODS OF FORMING AN ARTIFICIAL PUPIL.

I. The first attempt to restore vision, in cases in which the natural pupil had closed, or at least the first that was attended with success (see p. 658), was made by Cheselden, some time previous to 1728. In that year, he published a short account of two cases, in which the natural pupil having closed after the operation of couching, he formed an artificial pupil. He did this by introducing a small one-edged knife or needle, through the temporal side of the sclerotica, and through the iris into the anterior chamber; he then turned the cutting edge of the instrument towards the iris (*fig.* 99.), and as he withdrew the knife, divided the iris transversely, so as to leave an incision in that membrane, or an artificial pupil, extending to two-thirds of its diameter. (*Fig.* 100.) In his first case, he formed the artificial pupil above the centre of the iris or place of the natural pupil, because he did not know how low he might have lodged the cataract in the operation of couching, which had led to the closure of the natural pupil. In his second case, for what reason he does not mention, he formed the artificial pupil below the middle of the iris. His account of the whole is so brief, that we are left in doubt how far the first patient recovered sight. The second, he states, thought every object at first farther from him than it was in reality, but soon learned to judge the true distance.[1]

Fig. 99.

Fig. 100.

Such was the original method of forming an artificial pupil. As other methods have since been invented, we may distinguish this as an *artificial pupil by incision.*

II. In the hands of the first Wenzel, Cheselden's operation failed, and this led him to invent another method of opening up an artificial passage for the rays of light through the iris, in cases similar to those in which Cheselden had operated, namely, closed pupil after an operation for cataract. Having pierced the cornea with the point of the extraction-knife, as in the operation of extraction, he next plunged it through the iris between its temporal edge and the contracted pupil; then carrying the handle of the instrument backward, he brought out its point through the iris on the nasal side of the contracted pupil, and through the cornea, as in the operation of extraction. Carrying the knife onwards, he divided at once both the iris and the cornea, only that he necessarily completed the semicircular section of the former before that of the latter. (*Fig.* 101.) He then introduced a small pair of scissors through the incision of the cornea, and cut off the flap of the iris.[2] This, then, is what we term an *artificial pupil by excision.*

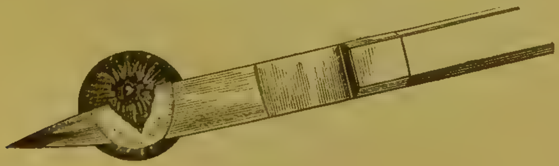

Fig. 101.

III. The facts that occasionally even a slight blow on the eye will separate a portion of the circumference of the iris from the choroid, (*Fig.* 43., p. 396), that in operating for cataract with the needle similar separations sometimes happen, and that the *false pupils,* as they may be called, which are thus formed, often continue permanently open, were the means of suggesting to different operators the idea of a third method of forming an artificial pupil. Scarpa, for instance, having passed a needle through the temporal side of the sclerotica, advanced its point as far as the upper part of the nasal margin of the iris, which he pierced so that the point of the needle became just perceptible in the anterior chamber, close to the edge of the cornea. He then with the needle pressed upon the iris from above downwards and from within outwards, so that a portion of its edge might be separated from the choroid. Placing the point of the needle upon the inferior angle of the commenced fissure, at the same time drawing the iris towards the temple, he continued the pressure till the separation (*Fig.* 102.) was of sufficient extent. Scarpa first employed a straight needle, but afterwards recommended one which was bent, as better calculated for the formation of this *artificial pupil by separation.*[3]

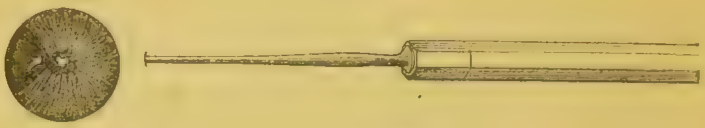

Fig. 102.

There are three original kinds of operation, then, for the formation of an artificial pupil, viz. *incision, excision,* and *separation;* and all three were invented for the purpose of restoring vision, when the natural pupil had closed after an operation for cataract.

IV. There are other cases, besides closure of the pupil after an operation for cataract, in which the formation of an artificial pupil becomes necessary, and as an example of these, I may mention, opacity of the centre of the cornea. Suppose that the central portion of the cornea, to the extent of $\frac{1}{5}$ inch in diameter, is occupied by a dense leucoma, even although the natural pupil is open and moveable, and the iris perfectly healthy, the patient will be deprived of any useful degree of sight. If he turns his back to the light, indeed, he may perhaps see a little past the edge of the speck, he may also discern objects obscurely in the twilight, when the pupil dilates, in consequence of the moderate light to which the eye is exposed; but in bright light he sees nothing. We sometimes find that artificial dilatation of the pupil by belladonna suffices in such a case to restore a considerable share of useful vision. I have known patients affected with partial opacity of the cornea, continue for many years the daily application of a filtered solution of belladonna to the conjunctiva, for the purpose of dilating the pupil, so that the light might enter the eye between the edge of the speck and the pupillary edge of the iris. In many cases, however, of partial opacity of the cornea, the speck is so broad, that dilatation of the pupil to the utmost extent attainable by belladonna, or by atropine, cannot restore any useful degree of vision. In these cases, then, and also when the frequent application of the belladonna proves irksome, we are naturally led to the expedient of withdrawing a portion of the iris from behind the lucid part of the cornea. It would evidently be impossible, however, to do this by incision, excision, or separation, according to the modes already described as having been adopted by Cheselden, Wenzel, and Scarpa, without injuring the crystalline lens, and thereby producing cataract. This, of course, must be avoided, and hence have arisen certain necessary changes in the methods of forming an artificial pupil, according to the condition of the cornea and crystalline lens. In the cases operated on by Cheselden, Wenzel, and Scarpa, the whole cornea being transparent, and the lens no longer occupying its natural place, an aperture for the transmission of light was the whole object of their solicitude, it being of little consequence where or how the new pupil was obtained. It is very different, when the artificial aperture must be placed behind a particular portion of the cornea, and when the lens being transparent must not be touched during the operation. Wenzel's excision of a *central* portion of the iris, was originally adapted for cases of closed pupil, after the operation of extraction, although he afterwards extended it to cases of closed pupil in which the lens had not been removed; but it could be of no service when the natural pupil was open, and the entrance of light into the eye impeded merely by opacity of the centre of the cornea. For this sort of case, the plan is, to extend the natural pupil to one side, in such a way that the extended portion shall be behind the transparent edge of the cornea. This may be done by making a small opening through the cornea close to its edge, and simply bringing out a portion of the iris through the opening, leaving it to unite to the wound, an operation which is called *extension of the pupil by prolapsus;* or by snipping off the portion of iris which protrudes, which is styled *artificial pupil by lateral excision.* The portion of iris to be fixed in the wound, or to be cut off, either protrudes with the gush of aqueous humour, as we make the incision of the cornea, or is to be drawn out with a small hook or pair of forceps. Whichever plan is adopted, whether extension of the pupil by prolapsus, or artificial pupil by lateral excision, the appearance of the eye after recovery will be similar to what is represented in *fig.* 103.

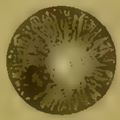

Fig. 103.

The operations for artificial pupil, although founded on the three simple plans of *cutting through* the iris, *cutting out* a piece of it, or *separating* part of its circumference from the choroid, have, like the operations for cataract, undergone an endless variety of modifications, suggested partly by the great diversity of the diseased states of the eye requiring an artificial pupil, and partly originating in the peculiar notions of different operators. Even combinations of the operations in question have sometimes been found available.

Two of the modifications referred to, I must here shortly notice.

Cheselden's incision through the sclerotica is in a great measure superseded by incision with scissors through the cornea, a method of operating which we owe to Janin, but which was much improved by M. Maunoir, of Geneva.

Separation of a portion of the iris from the choroid, by means of a curved needle introduced through the sclerotica, is also almost entirely laid aside. Separation is now effected by a hook, passed through an incision of the cornea; and in order to prevent the separated portion of iris retreating to its former place, and the artificial pupil thus closing, the separated bit of iris is drawn through the incision of the cornea, and left there to be fixed by adhesion.

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[1] Philosophical Transactions for 1728; Vol. xxxv. p. 451.

[2] Traité de la Cataracte, par M. de Wenzel, fils, pp. 190, 198; Paris, 1786.

[3] Saggio di Osservazioni e d'Esperienze sulle principali Malattie degli Occhi; Pavia, 1801.

SECTION II.—DISEASED STATES OF THE EYE REQUIRING THE FORMATION OF AN ARTIFICIAL PUPIL.

The diseased states of the eye, requiring that an artificial pupil should be formed for the restoration of vision, are almost entirely the effects either of some of the ophthalmiæ, or of inflammation consequent to injury or operation. According to the parts affected in different cases, they may be grouped under the seven following heads.

I. *Partial opacity of the cornea.* — This includes those cases in which there is such a degree of opacity of the central portion of the cornea as to cover the pupil, while the whole, or at least a part, of the circumferential portion remains transparent. The pupil itself is open; the iris unadherent; every part, in fact, is supposed to be healthy but the cornea. Through the transparent portion of the cornea the light enters, but is arrested by the iris; let a part of this opaque membrane be drawn aside or removed, the light, then allowed to pass through, will be transmitted to the retina, and vision restored. Should the opaque portion of the cornea be so limited in extent that dilating the natural pupil by belladonna suffices to restore a considerable share of useful vision, it would be wrong to hazard an operation; but should the opacity be so extensive that dilatation by belladonna adds little or nothing to the patient's perception of objects, we require, behind the lucid portion of the cornea, either to clip through the iris from its pupillary to its ciliary margin, to extend the natural pupil by prolapsus, or to remove a part of the iris by the operation either of lateral excision or of separation. When there is a considerable field of transparent cornea, the plan most frequently followed has been to open its circumference, in a certain extent, close to the sclerotica, allow the iris to protrude, or, if it does not do so, draw a portion of it out, and snip off as much with the scissors as shall form a sufficient aperture in the iris, to serve as an artificial pupil. On the other hand, if the lucid portion of the cornea is small in extent (not more or perhaps less than a line's breadth), it would be unsafe to cut into that portion, in order to extract a part of the iris for excision; for should the wound inflame, the whole of the transparent segment of the cornea might thus be rendered opaque, and all chance of restoring sight destroyed. In such a case, the operation of separation must be had recourse to, not, however, in the manner practised by Scarpa, and shortly described in the preceding section, but by means of a hook introduced through an incision of the cornea, the incision being made at a distance from the lucid segment.

II. *Partial opacity of the cornea, with partial adhesion of the iris to the cornea.* — The cases falling under this head are generally the results of penetrating wound or of ulcer of the cornea. Like the cases of uncombined opacity of the cornea, those belonging to this class vary remarkably in regard to the extent of the opacity. The central portion only may be opaque, or the opacity may leave but a small segment of lucid cornea close to the sclerotica. The iris also is involved in these cases, in very different degrees. The pupillary edge of the iris, in a single point merely, may be adherent to the cornea, without almost any distortion of the pupil. In other cases, although the edge of the pupil has not been directly involved in the ulcer which has ended in the opacity of the cornea, the pupil is distorted, contracted, and, though partially open, is so hid behind the leucoma, that vision is completely impeded. In a third set of cases, almost the whole pupillary edge of the iris has been involved in the ulcer, and is therefore adherent to the cicatrice, while the anterior chamber is nearly obliterated by the advancement of the iris towards the cornea. In a fourth set, the united cicatrice and iris may have protruded, so as to form a partial staphyloma, while a portion of the cornea and iris continue uninvolved.

The same rule will guide us in the choice of an operation for artificial pupil in cases of this class, as in those of the former; namely, that when there remains only a small segment of the cornea transparent, this is too valuable to be tampered with, no incision is to be risked into that transparent segment, lest it should thereby be rendered permanently opaque, but an incision must be made at a distance, and the iris withdrawn from behind the transparent part by separation from the choroid. When, on the other hand, there is a considerable field of cornea transparent, extension of the pupil by prolapsus, or artificial pupil by lateral excision, will in general be had recourse to; not, indeed, with the same facility as if there was no adhesion between the iris and cornea, but still without any insurmountable difficulty. The iris will probably not be protruded by the mere pressure of the aqueous humour rushing through the incision of the cornea, but the hook or the forceps will in general serve easily to extract the portion of iris which is to be prolapsed or to be removed by the scissors.

III. *Closure of the pupil, the lens and capsule being presumed transparent.* — Closure of the pupil from inflammation of the iris, without any opacity of the capsule, or any adhesion between it and the iris, if it ever happens, is certainly a very rare occurrence, and, from the appearances presented, must be exceedingly liable to be taken for a case of closure with adhesion, the capsule being opaque, at least within the area of the contracted pupil. As it is a rule to which there is no exception, that, in forming an artificial pupil, if the lens and capsule are transparent before the operation, they must be left untouched, it would evidently be wrong, in any case in which there was reason to suppose that closure of the pupil was the whole amount of the disease, or that the capsule was opaque merely within the area of the contracted pupil, while the rest of it, along with the lens, was transparent, to have recourse to the operation of the incision, or to perform any operation except in the most cautious manner. Extension by prolapsus or lateral excision is indicated in such a case.

After laying hold of a portion of the iris and extracting it through the incision of the cornea, a clot of unorganised lymph may be found to occupy the posterior chamber, without adhering to the capsule, and is to be removed. Much more frequently, the closed pupil is found adherent to the centre of the capsule, which is opaque, the circumference being transparent; while in other cases, we discover, on removing a portion of the iris, that our great caution has been unnecessary, as the whole front of the capsule, or the entire lens, is opaque; or on attempting to extract a portion of the iris, we find so firm an adhesion between that membrane and the capsule, that it is impossible to effect our object, so that the cases will require to be treated like those of the next class. No evil, however, can arise from our having entertained a more favourable view of the case than we find to be warranted by the state of the parts, when we come to operate. The capsule being opaque only within the area of the contracted pupil, extension by prolapsus or lateral excision is the operation most likely to restore vision. Should the whole field of the capsule or the lens prove opaque through the artificial pupil formed by lateral incision, we may immediately introduce the needle and divide the cataract. Sometimes we may succeed in extracting the lens in fragments, and perhaps the capsule also; in other cases, the safer plan will be to delay till the eye has recovered from what has been done, and afterwards proceed to remove the cataract from behind the new pupil.

IV. *Closure of the pupil, with firm and extensive adhesion of the iris to the capsule, or the capsule or the lens known to be opaque.*—In this case, something requires to be done for the removal of the lens, either at the moment of forming the artificial pupil, or subsequently. For the formation of the artificial pupil, incision with the scissors is sometimes chosen, and performed through an opening of the cornea sufficiently extensive to allow the lens to be extracted. Cheselden's method has also been practised in such cases, the lens being divided by the iris-knife, and its fragments thrust forwards through the new pupil into the anterior chamber for solution. Some have preferred, in such circumstances, forming first an artificial pupil by lateral excision, or by separation, and afterwards have disposed of the lens by division or displacement. Others have chosen central excision, and immediately proceeded to extract the cataract through the artificial pupil.

V. *Closure of the pupil after an operation for cataract.*—As it was in cases of this kind that Cheselden, with such signal success, had recourse to a simple incision of the iris for the purpose of forming an artificial pupil, it may appear strange that Wenzel, when he tried the same operation, was so disappointed, that he laid it aside, and adopted that of central excision. The cases, however, in which Cheselden succeeded, and those in which Wenzel failed, in forming a permanent artificial pupil by incision, differed, probably, in a most material circumstance, namely, the healthy or unhealthy state of the iris; for, as I shall have occasion in a following section to explain more particularly, an incision through an iris, the texture of which has suffered but little from inflammation, is likely to remain permanently open, while one through the same membrane after it has become thickened and otherwise changed in texture, almost invariably closes, and its edges reunite. Hence, it is necessary to lay it down as a rule regarding the cases falling under this head, that if the appearance of the iris and the history of the case lead to the conclusion that the closure of the pupil has taken place without any severe or long-continued inflammation of the iris, simple incision may be practised, either according to Cheselden's method, or some other, more recently devised; but that if the iris appears to be much altered in texture, or if the history of the case declares that severe and long-continued iritis has attended the closure of the pupil, excision or separation ought to be adopted.

VI. *Closure of the pupil from protrusion of the iris after extraction.* —This is a very peculiar case, inasmuch as the fibres of that part of the iris which is unconnected with the cornea are completely on the stretch, so that they are easily divided, and the artificial pupil formed by incision instantly expands. From these circumstances, this case is by far the best suited for the operation of incision. While in many other cases, there may be room for deliberation between the different kinds of operation, in this there is none.

VII. *Partial opacity of the cornea, closure of the pupil, adhesion of the iris to the cornea or to the capsule, and opacity of the capsule or lens.* — So complicated a case as this might appear, on first enunciation, as altogether beyond relief. Yet some of the most striking recoveries of sight, by means of an artificial pupil, have taken place under circumstances of this unfavourable nature. There is, we shall say, a lucid segment of cornea, from behind which, by means of lateral excision or separation, we remove a portion of the iris; this reveals an opaque lens and capsule, which after some time we remove by the needle, and thus restore vision.

SECTION III.—GENERAL RULES REGARDING ARTIFICIAL PUPIL.

1. As in every instance, those states of the eye which require the formation of an artificial pupil, originate partly, if not entirely, in inflammation, the renewal of which might prove fatal to the success of the operation, it is to be received as a general rule, that no artificial pupil be formed, unless the patient's general health is good, and the eye has for a considerable space of time been perfectly free from every symptom of inflammation, except those irremovable ones, to counteract the effects of which the operation is undertaken.

2. An artificial pupil ought never to be formed in the one eye so long as the individual retains useful vision in the other; for to see well with the sound eye he would require to shut that in which the artificial pupil had been formed, and contrariwise; the axis of vision in the two eyes seldom, if ever, in such circumstances, being correspondent.

3. We ought not to attempt the formation of an artificial pupil in an eye with which the patient discerns common objects with tolerable distinctness, such as a pen, knife, scissors, &c., lest by the operation we deprive him of the degree of vision he enjoys.

4. It is of no use to form an artificial pupil, unless the portion of

cornea behind which it will be placed, is tolerably clear. If it be nebulous, little or no accession of vision will be gained. Cases occur not unfrequently of central leucoma, with anterior synechia, the circumferential portion of the cornea being so nebulous that the fibres of the iris are not visible. It is needless to attempt the formation of an artificial pupil under such circumstances. If we are left in doubt as to the degree of transparency of the circumferential portion of the cornea, and the existence of adhesion between it and the iris, we may make a puncture through the cornea, and try to pass an Anel's probe between the cornea and iris, thus ascertaining whether they be adherent, and testing the transparency of the cornea. If the probe is clearly seen through the cornea, we may proceed with the operation of separation.

5. That condition of the eye in which the aqueous humour is supplanted by a coagulable yellowish fluid, resembling the serum of the blood, is an unfavourable complication, marking the existence of long-continued disease in the iris and neighbouring parts. On puncturing the cornea, the inflammatory or dropsical fluid in question escapes, and the iris, previously of a yellowish or greenish hue, assumes more of its natural colour; but on proceeding to lay hold of the membrane, or to make any incision into it, it will generally be found in such a softened state, that we shall be unable to accomplish our purpose, while inflammatory reaction is almost certain to follow the operation.

6. An operation for artificial pupil ought not to be undertaken if there be present granular conjunctiva, vasculo-nebulous cornea, varicose dilatation of the external blood-vessels, attenuation of the sclerotica, bogginess of the eyeball, preternatural hardness, dropsy, atrophy, microphthalmos, strabismus, or the like.

7. Neither would we operate where the retina was not tolerably sound. Should the diseased state of the eye be a speck of the cornea, and should the patient, on the pupil being dilated with belladonna, see no better than before, it is probable the vitreous humour and retina are unsound, so that, on attempting to form an artificial pupil, the vitreous humour would burst and be evacuated, or, after even the most successful formation of a pupil, the amaurotic state of the retina would prevent any accession of vision. If the pupil is obliterated, and the dull discoloured iris bulges much towards the cornea, and especially if this state is the result of syphilitic inflammation, the retina is probably unsound. The iris, in such cases, is generally much thickened, and bleeds more than usual on being cut.

8. Although operating in such a case must be a mere experiment, yet it may sometimes occur that the formation of an artificial pupil will restore vision to an eye which seemed unable to distinguish light and shade. Generally, indeed, it is regarded as an indispensable condition for the performance of the operation, that the eye be able to discriminate between different gradations of light; yet it is a conceivable case, that from the natural pupil being completely obliterated, the iris at the same time thickened, and lymph accumulated in the posterior chamber, added perhaps to opacity of the lens and

capsule, the patient shall be slow and doubtful in his discrimination of light and shade, although the retina is still susceptible of resuming its office, were the impediments now enumerated removed by operation. Pönitz, the German translator of Assalini on Artificial Pupil, states that in two cases he operated with success, although the patients were previously unable to distinguish even the brightest light. As such success is contrary to general experience, one cannot help suspecting that the previous testing of the sensibility of the eye had not been instituted with sufficient care; for even through the sclerotica, with the cornea totally staphylomatous and lined by the adhering iris, light can be distinguished when the retina is sound.

9. Patients sometimes present themselves with both eyes apparently in a condition demanding the formation of an artificial pupil; but the one with fewer external morbid changes than the other, and therefore likely to be fixed on as the one for operation. On careful examination, however, I have known the worse looking eye to prove distinctly sensible to light and shade, and the better looking one to be totally amaurotic.

10. The formation of an artificial pupil ought rarely, if ever, to be attempted in a scrofulous subject under the age of puberty, more especially if the diseased state of the eye, rendering this operation necessary, has originated in scrofulous ophthalmia, independent of injury. After an operation in such a subject, inflammation of the scrofulous character is almost sure to follow, and will probably destroy the eye. In the course of a few years after puberty, the operation may be performed with less danger.

11. The failure of the operation for artificial pupil is more frequently owing to the bad selection of cases, than to any other cause. Performed on account of morbid changes in the cornea or iris, resulting from specific diseases, as scrofula, syphilis, or gout, it is generally unsuccessful. The case is more hopeful, if the diseased state of the eye is the result of one of the puro-mucous ophthalmiæ; and still more so, if it be directly of traumatic origin. If sympathetic ophthalmitis has brought the eye to a condition in which only an artificial pupil can afford a hope of vision being restored, the chance of success is very slender.

12. The artificial pupil should be formed as nearly behind the centre of the cornea, or, in other words, as much in the situation of the natural pupil as possible. "So important," says Mr. Bowman, "do I regard a central position, that I would rather make a pupil near the centre, behind a portion of the cornea *somewhat nebulous*, than at the margin, behind a part perfectly clear."[1]

13. If the artificial pupil cannot be formed in or near the centre of the iris, and if the operator has a choice of placing it behind either the nasal or the temporal edge of the cornea, he ought to prefer the former of these two situations, both as affording a more useful degree of vision, and as causing less deformity. Often, however, the operator has no choice, but must form the artificial pupil behind the only portion of cornea which remains lucid, whether that be at the temporal or nasal edge, at the upper or the lower. It is easier, in general, to form an artificial pupil at the temporal

edge than at the nasal; and it is urged by Mr. Gibson, that the patient enjoys a greater field of vision when the pupil is towards the temple. This, however, may be doubted; and, at any rate, there is a much greater degree of awkwardness in the appearance and employment of an eye in which the pupil is behind the temporal edge of the cornea, the patient evidently finding it difficult to turn the eye so as to bring the pupil into the necessary direction, and embrace with it the usual range of objects.

14. If an artificial pupil is to be formed in each eye, some direct us to make the one behind the temporal side of the one cornea, and the other behind the nasal side of the other cornea, alleging that in this way there is a greater degree of correspondence between them than if they were formed in any other situations except in the centre of the eyes. If both pupils are towards the temple, as in Maunoir's patient, the Marquis de Beaumanoir [2], the appearance is far from being natural or agreeable.

15. As an artificial pupil generally possesses no power of contracting or dilating, care must be taken that it is made neither too large nor too small. It is remarkable, indeed, how useful a very small artificial pupil may prove, as is well illustrated in the celebrated instance (*Fig.* 104.) of a man of the name of Sauvages, operated on by Demours, by excision.[3] In general, however, so small a pupil does not prove very serviceable; while, on the other hand, an artificial pupil much above the medium size of the natural one, exposes the eye to be constantly dazzled, and is thus rendered comparatively useless.

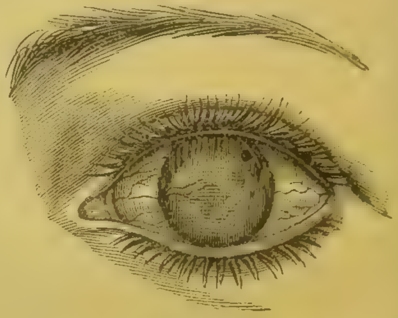

Fig. 104.

16. Shape is of less consequence than position and size. "A large orifice," remarks Mr. Bowman, "if it take the direction of a radius in front of the lens, allows of better sight than a circular pupil of the same area. In fact, I have found a long, narrow, elliptical slit, extending from the situation of the natural pupil to the very border of the lens, sufficient to permit almost perfect vision."[4]

17. In all cases in which the lens and capsule are either evidently transparent, or are thought likely to be so, the artificial pupil must be formed in such a way as to leave these parts untouched.

18. In general, the operation should be performed through the cornea rather than the sclerotica, and by means of a puncture rather than an extensive incision, as inflicting less injury on the structure of the eye, and as attended with less risk of hæmorrhage and of subsequent inflammation.

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[1] Medical Times and Gazette, January 3. 1853, p. 12.

[2] Medico-Chirurgical Transactions; Vol. vii. pp. 305. 309; London, 1816.

[3] Traité des Maladies des Yeux; Tome iii. p. 426; Planche 46. Fig. 1; Paris, 1818.

[4] Op. cit. p. 13.

SECTION IV.—INCISION, EXCISION, AND SEPARATION COMPARED. CONDITIONS NECESSARY FOR THESE OPERATIONS.

I. The least complicated, but not always the easiest, mode of forming an artificial pupil, consists in one or more incisions through the substance of the iris, made in expectation that the opening so formed will gape, and continue permanent. If the opening through the iris is formed by one incision, it may run horizontally, so as to produce a pupil resembling that of the ruminating animals, or perpendicularly, so as to form one resembling the pupil of the cat tribe. The artificial pupil may be oblique in its direction, and may occupy the superior, inferior, nasal, or temporal portion of the iris; it may run, not in a straight, but, as Janin preferred it, in a curved line; or it may be formed, as Maunoir has recommended, by two incisions meeting each other at an acute angle. The formation of an artificial pupil by incision may be accomplished by passing the needle or knife through the cornea, and thus commencing upon the anterior surface of the iris, or the instrument may be entered through the sclerotica, and then pass through the iris into the anterior chamber. These particulars will be determined partly by the views of the operator, and partly by the state of the eye upon which he is to operate.

It must be evident, that it is an indispensable condition for the success of incision, that the iris be in such a state as shall secure the dilatation of the new pupil, as soon as the operation is completed. If the artificial pupil do not dilate, the iris will very soon heal, and the patient will be just where he was. In order that the new pupil may dilate, it is necessary that the substance of the iris be in a tolerably healthy state. If that membrane has sustained violent, long-continued, or frequently-repeated inflammation, its fibres are rendered incapable of contracting, and consequently if such attacks have ended in closure of the natural pupil, the iris is unfit to be operated on by incision. Whenever, then, the history of the case and the appearances of the eye lead us to believe, that there has been severe iritis, we ought to choose some other method of operating. It is not, however, in every case of closure of the natural pupil from iritis, that the fibres of the iris are rendered incapable of contracting, but only when the inflammation of the iris has been severe and long-continued, ending in thickening of that membrane, with sanguineous or lymphatic deposition in its substance, or on its posterior surface.

It is interesting to inquire how those differences of opinion have arisen, which have existed in the minds of operators regarding incision, and how this operation has occasionally succeeded, and at other times completely failed. The explanation will be found in the difference of cases; in the fitness of some, and unfitness of others, for this operation. In proof of this, we may refer to the testimony of Janin. The first case in which he performed incision was one of obliteration of the pupil from inflammation after extraction; and the second, obliteration from severe ophthalmia. In both, he made a horizontal incision to the extent of two-thirds of the diameter of the iris, and in both, on opening the eye some days after the operation, he found the artificial pupil completely closed, and the incision healed.[1] I believe that we are warranted in asserting, that the closure of these two artificial pupils would not have taken place, had the substance of the iris been in a natural state; and the proof of this may be taken from Janin himself. In several instances, while performing extraction of the cataract, this operator happened accidentally to wound the iris. Reasoning from his experience in the two cases of artificial pupil, he expected that these accidental wounds would heal. Here, however, he was disappointed. These incisions had been made in healthy irides, and on opening the eyes some days afterwards, he found the incisions more dilated than at the moment of operation.[2] Had he been led from these striking facts to compare his failures in the operation of incision with the success which had attended this method of operating in the hands of Cheselden, he might have discovered the true cause of the diversity of results; namely, the different states in which the substance of the iris must have been at the moment of operating. Instead of this, Janin was led to attribute his want of success to something faulty in the form and direction of his incision. The true cause unfortunately escaped him, as it did many of his successors, who, omitting a careful examination of the whole facts, bestowed their attention chiefly on the most effectual mode of dividing the two sets of muscular fibres of the iris. It was not in fact till the publication[3] of Sir William Adams's cases of artificial pupil by incision, that the objections thrown out against this operation by Scarpa and others were in some measure removed; although even Sir William missed the true secret of his own success, attributing it, not to the condition of the iris upon which he operated, but to the form of his knife, and the extent of his incision. We need not hesitate to assert, that in every case in which the substance of the iris is not greatly altered by inflammation, we may confidently expect the artificial pupil formed by incision to continue patent, in whatever direction or in whatever part of the iris the incision is made; above or below, or in the line of the natural pupil; whether it divides the radiating fibres only, the sphincter only, or both; and whether it is a mere pin-hole, or extends to two-thirds of the diameter of the iris. On one occasion I formed an artificial pupil by an incision which, *à priori*, we should have expected to have produced a mere slit between the radiating fibres, as in the operation neither they nor the sphincter was divided. The closed pupil was eccentrically situated towards the temporal side of the eye, and I therefore divided the iris towards its nasal side. The pupil assumed the rhomboidal shape shown in *fig.* 105., and permanent vision was restored.

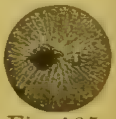
Fig. 105.

Besides a tolerably healthy state of the iris, of which we can judge pretty accurately from its colour, as seen through the cornea, there are other conditions necessary for incision. Among these we may mention a considerable field of transparent cornea, opposite to that portion of iris which is to be divided. We would never think of incision, if there were merely a narrow segment of cornea transparent, and all the rest opaque; for in such a case an artificial pupil by incision could be little more than a mere fissure, whereas a more considerable and more useful pupil might be formed by separating the iris from the choroid, and removing it completely from behind the lucid portion of the cornea.

Another condition reckoned necessary for incision, previously at least to the invention of the cannula-scissors, was, that the iris should possess a certain degree of tension, and be actually fixed in some measure, either by closure of the natural pupil, or by partial adhesion to the cornea. This condition exists in a very striking manner in those cases of closure of the pupil and dragging of the iris, which occur from prolapsus of this membrane, after extraction of the cataract. Not merely is the iris easily divided in these cases, but the new pupil instantly gapes and rarely afterwards contracts, so that they are actually the best cases for the operation of incision. If, on the other hand, the pupil is perfectly free, the iris will glide from before the point of any instrument in the shape of needle or knife, with which we might attempt to divide it; and even were the iris transfixed, it would be difficult to give the incision the form and extent required. In all cases, then, in which partial opacity of the cornea merely is the occasion of our having recourse to the formation of an artificial pupil, incision with any single cutting instrument, on account of the danger of wounding the crystalline capsule, as well as for the reason now stated, would be improper. To incise the iris, from its pupillary edge towards its ciliary edge, even when the membrane is perfectly free, it has been proposed to use the self-penetrating cannula-scissors, the blade which is to pass between the iris and the lens being blunt-pointed.

II. As excision is the cutting out and completely removing from the eye of a portion of the iris, this operation can be performed conveniently and safely only through the cornea. It will require also a considerable opening in the cornea, in order to allow either a spontaneous protrusion of the portion of iris to be removed, or the introduction of such instruments as are to drag that portion forth, or be employed within the eye in snipping it out. As to the situation, form, and dimensions of an artificial pupil by excision, these must depend partly on the fancy of the operator, but chiefly on the incontrollable circumstances in which the iris, cornea, and other parts implicated in the operation are placed. Above all, the situation and dimensions of the new pupil must depend on the extent and place of the transparent part of the cornea.

The cases in which the pupil is open and the iris free, and which we have already mentioned to be totally unfit for the ordinary operations of incision, are the very best for excision; for it is evident, that it is only in such cases that the protrusion of the iris through the wound of the cornea will take place with that degree of facility, and to that extent, which will enable us to finish the operation simply by laying hold of the prolapsed portion of iris with the forceps, and snipping it off with the scissors. If, on the other hand, the natural pupil is completely closed, and the posterior surface of the iris glued to the parts behind it, excision in this easy way is impracticable, as a protrusion of the iris through the wound of the cornea will neither take place spontaneously, nor can it be readily effected by means of the hook or forceps introduced into the anterior chamber.

In those cases in which the iris is only in a small extent adherent to the cornea, excision may in general be performed with ease, a very limited adhesion seldom preventing a spontaneous protrusion of the iris through the wound of the cornea. But if the adhesion between the iris and the cornea is extensive, involving perhaps the whole circumference of the pupil, it is often difficult and sometimes impossible, to effect a sufficient protrusion, even with the aid of the hook or forceps. These instruments are apt, however, to tear away a bit of the iris, and thus an artificial pupil may be formed by *laceration.*

Vision may occasionally be restored in cases of very limited adhesion of the iris to the cornea (*Fig.* 53. p. 484), simply by separating the adherent portion, or, if this cannot be accomplished, by cutting across the adherent part, thus freeing the iris, and allowing the natural pupil (in the latter instance a little enlarged) to resume its functions.[4] A quarter-section being made at the edge of the cornea, a small probe may be introduced, and an attempt made to separate the adhesion, which will sometimes succeed, if the adhesion has been consequent merely to inflammation, without any ulceration of the cornea or prolapsus of the iris. If it does not succeed, we may either, with Beer, introduce Cheselden's iris-scalpel, and cut the adherent point of the iris across, or, as Assalini recommends, use a very small pair of scissors (the cannula-scissors, for instance) for the same purpose.[5] Should this *abscission* of the iris, as it may be called, seem insufficient to restore the natural pupil to its office, the opaque part of the cornea still covering it too much to permit the necessary quantity of light to enter the eye, we may immediately enlarge the pupil by the excision of a portion of the iris. Cases of this sort are capable of being improved, however, simply by *prolapsing* a portion of the iris, and thus dragging the pupil from behind the opacity; a method of operating successfully practised by Himly[6], and extensively used by Tyrrell.[7]

III. Separation is an operation which by some has been deemed applicable in almost every case requiring the formation of an artificial pupil, but which I am inclined to employ less frequently than either incision or excision. It is undeniable that there is no case in which separation might not be performed, let it be one of partial opacity of the cornea merely, of closure of the natural pupil, or of some of the complicated consequences of injury or of inflammation; but it is also true, that, on account of the laceration of blood-vessels and nerves with which it is attended, separation is more severe and painful, accompanied by greater danger to the eye, and followed by a more tedious recovery, than either of the other modes of operating. The artificial pupil formed by separation, unless very particular precautions are adopted, and the parts are in a tolerably healthy state, is also extremely apt to close, lymph filling up the new pupil, and the portion of iris which has been separated returning to its former situation, and re-adhering to the choroid. For these reasons, we should always seek to attain our object by excision or incision, and only when these are unlikely to fulfil our intention, ought we to have recourse to separation.

There is one advantage which separation possesses over incision, and which may therefore serve in certain cases to recommend it; namely, that with proper care the lens and capsule may be left untouched in separation, which in the ordinary methods of incision, it is difficult or impossible to accomplish. By separation, also, we are able to form the largest possible pupil admitted by the state of the parts, which, when the lucid segment of cornea is very small, is an advantage of no mean importance.

It has been stated in a previous section, that Scarpa practised separation simply by introducing a curved needle through the sclerotica, and with its point dragging away, on the nasal side, the ciliary edge of the iris from the choroid. This might no doubt be done with impunity in cases of closure of the natural pupil after an operation for cataract, but would be quite inapplicable if the lens and capsule were sound. Hence another method of performing separation has been adopted, namely, opening the cornea, and introducing a hook through the anterior chamber, avoiding thus the lens and capsule. Separated, however, even by the hook introduced in this manner, the iris, unless perfectly healthy, and its fibres quite contractile, would speedily return to its former place, and the new pupil be thus obliterated, were not some means adopted for preventing this. To Langenbeck, we owe the additional step of bringing out through the incision of the cornea a portion of the separated iris, allowing it to remain strangulated between the lips of the wound till adhesion takes place, and thus rendering it impossible for the new pupil to close.

The situation and dimensions of an artificial pupil formed by separation, whether it is to be behind the nasal or the temporal, the superior or the inferior edge of the cornea, and whether it is to be merely a small chink, or a triangular opening, each side measuring a couple of lines, will be determined by the state of the eye in which the operation is to be performed. In the most favourable cases, an artificial pupil by separation assumes the form of a triangle, its base being circular and formed by the ciliary processes, and the two other sides straight lines. But in many instances, we employ this method of operating, when merely a small segment of the cornea remains transparent, and the iris is everywhere else united to the opaque portion of the cornea, so that the pupil must necessarily be small, and it may be impossible to produce the prolapsus above recommended for preventing the iris from retreating towards the choroid.

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[1] Mémoires et Observations sur l'Œil, pp. 182, 184 ; Lyon, 1772.

[2] Ibid. pp. 185, 186, 187.

[3] Practical Observations on Ectropium, &c.; London, 1812.

[4] Mauchart de Synechia, Halleri Disputationes Chirurgicæ Selectæ; Tom. i. p. 447; Lausannæ, 1755.

[5] See a Case of Abscission by Dr. Ryan, Dublin Hospital Reports ; Vol. ii. p. 370.

[6] Wagner de Coremorphosi, p. 22; Göttingæ, 1818.

[7] Practical Work on the Diseases of the Eye; Vol. ii. p. 499 ; London, 1840.

SECTION V.—ARTIFICIAL PUPIL BY INCISION.

Syn.—Corotomia; from κόρη, *pupil*, and τέμνω. *I cut.*

It is advantageous, in all operations for artificial pupil, to lay the patient on his back, with his head raised on a pillow; and the assistant should be aware, that he will require to support one or other of the eyelids, or both, according as he is directed by the operator. In excision, particularly, both hands of the operator are, at a certain stage of the operation, occupied with the instruments, and cannot therefore be spared for holding open the eyelids.

Although belladonna has in general little or no power over an iris which has suffered such a degree of inflammation as to end in closure of the pupil, there can be no harm in applying the solution of atropine to the eye, an hour or two before the operation of incision. In any of the other operations for artificial pupil, belladonna would be improper.

Chloroform should be administered, unless the patient seems likely to preserve a perfect self-command during the operation. By its influence the eye is rendered perfectly quiet, and the rolling of it, which is so apt to prove annoying, is avoided. If the eye proves restless, chloroform not being used, it may sometimes be controlled by fixing a fine hook in the cornea, if it happens to be partly opaque, or in the tunica tendinea.

§ 1. *Incision through the Sclerotica.*

The instrument for dividing the iris through the sclerotica, is a small knife (*Fig.* 106.), about two-thirds of an inch in length, and the twentieth of an inch in breadth, with a straight back, sharp point, and curved edge, cutting for the length of about three-tenths of an inch. Being single-edged, this instrument can be made to cut much keener than any sort of cataract needle; while, from its small size, it passes through the coats of the eye and the iris with facility.

The operation divides itself into three periods; namely, *first*, The introduction of the iris-scalpel through the sclerotica and pars non-plicata of the ciliary body; *secondly*, The passage of the instrument through the iris into the anterior chamber; and *thirdly*, The division of the iris.

1*st Period.* The cutting edge being directed backwards, the operator passes the iris-knife through the sclerotica and choroid, exactly in the equator of the eye, at the distance of $\frac{1}{6}$ inch behind the temporal edge of the cornea, and to the depth of $\frac{1}{8}$ inch into the vitreous humour.

2*d Period.* He now carries the handle of the instrument back towards the temple, and at the same time advances its point towards the union of the temporal with the two nasal thirds of the iris; pressing forward its point, he sees it appear between the fibres of the iris, and project into the anterior chamber. He now brings the handle forwards, which has the effect of directing the point of the instrument towards the nasal edge of the cornea, and he pushes it cautiously on through the anterior chamber, as far as he can without touching the cornea. (*Fig.* 101. p. 847.)

3*d Period.* It is now by a double motion of the instrument, namely, backwards and outwards, that the iris is to be divided transversely, to the extent of two-thirds of its diameter. This will sometimes be effected by merely pressing on the iris, the

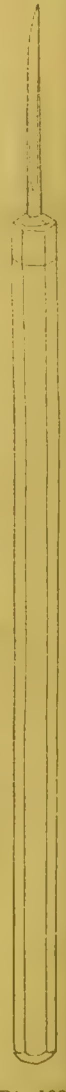


Fig. 106.

knife suddenly starting through that membrane, and thus forming an artificial pupil of the required extent; but more frequently neither mere pressure on the iris, nor one rapid stroke of the edge of the iris-scalpel will suffice, but we must employ repeated strokes, as if we were dividing the membrane fibre by fibre, and by a drawing motion of the instrument as well as pressure with its edge. All this must be done gently and cautiously, lest we separate the iris from the choroid.

If our first attempt has not divided the iris to a sufficient extent, the point of the scalpel is to be again carried forward and again withdrawn, until the incision is of the proper length. (*Fig.* 100. p. 847.) Before finally removing the instrument, we ought to notice, unless the flow of blood from the wounded iris prevents us, whether the artificial pupil expands; and if the edges of the incision do not immediately separate from each other, in consequence of the contraction of the fibres of the iris, we should open up the pupil a little by touching its edges with the flat sides of the instrument. The iris-scalpel is then to be withdrawn, in the same line of direction as that in which it was introduced.

This method of operating was adopted by Cheselden, in cases of closure of the pupil after an operation for cataract, but it has also been occasionally had recourse to, especially by Sir W. Adams[1], when, along with closure of the pupil, an opaque lens or capsule still occupied the axis of vision. When this kind of complication exists, the preliminary steps of the operation are such as have been already described. In dividing the iris, the capsule, and probably the lens also, will be cut across, and before withdrawing the scalpel, the operator must endeavour to complete the division of the cataract as far as he can. The aqueous humour will by this means be admitted to act upon the fragments of the lens, but should the absorption of these afterwards appear retarded, so that they continue to form an obstacle to vision, in the course of two or three months after the formation of the artificial pupil, the operation of division may be repeated, as in ordinary cases of cataract.

If the iris is adherent to a much thickened capsule, it will be difficult to perform incision in the manner above described, and even were the iris and capsule cut through, it is almost certain that the new pupil would not expand, but its edges speedily unite. If we have proceeded to operate by incision through the sclerotica in such a case, it is needless to attempt the separation of the iris from the capsule. It is preferable to withdraw the scalpel, and at a future period proceed to the formation of an artificial pupil by some other method, better adapted to the circumstances of the case.

§ 2. *Incision through the Cornea.*

1. *With the knife.*—At one period of his practice, and in a particular set of cases, Beer adopted a very simple, and, at the same time, sufficiently successful mode of performing incision through the cornea. The cases in question were those in which, in consequence of prolapsus of the iris after the operation of extraction performed at the lower edge of the cornea, the natural pupil was closed, or at

any rate so distorted and hid behind the cicatrice of the cornea, as to be incapable of serving for useful vision, while at the same time the upper half of the iris was dragged down toward the cicatrice, and its fibres put very much on the stretch.

In such cases, Beer introduced a double-edged knife, about $\frac{1}{5}$ inch in breadth, and shaped exactly like a lancet, through the upper part of the cornea, and, carrying it a little way through the anterior chamber, he then penetrated the iris (*Fig.* 107.). He thus formed a transverse incision directly behind the middle of the lucid portion of the cornea, and which, from the tense state of the fibres of the iris, instantly gaped.[2] The same operation may be practised through the lower part of the cornea, when extraction at the upper edge has been followed by prolapsus of the iris; or the incision may be made in a vertical direction by introducing the knife at the temporal edge of the cornea.[3]

Fig. 107.

In cases of extensive leucoma, with anterior synechia, the result of traumatic inflammation, with a crescent of clear cornea, and an apparently healthy portion of iris behind it, the iris-knife, or a broad cataract needle, may be passed through the edge of the cornea, and cautiously insinuated between the surfaces of the iris and cornea till its point has reached the centre of the exposed piece of iris; the instrument is then to be rotated, and its cutting edge being directed against the iris, as much of it is to be divided as shall leave a sufficient artificial pupil.[4]

Mr. Estlin mentions his having seen Mr. Alexander perform this operation many years ago, in cases in which chronic inflammation of the iris had accompanied the formation of cataract, where only a little pupillary aperture was left, and that of an irregular shape, the iris being apparently thinned, and its posterior surface glued down to the opaque capsule. "The cataract behind," says he, "is often solid, and affords a good resistance to the knife in cutting the fibres of the iris. It is uncertain what will be the effect of the sudden incision. I have sometimes, by one cut, divided the fibres of the iris, and displaced the cataract, so that a clear pupil was instantly produced, and a sudden blaze of light let in upon the retina, quite astounding to the delighted patient. At other times, a permanent aperture in the iris will be made, of sufficient extent to allow of a thorough view of the opacities behind the pupil, and to admit of future operations with the needle for their removal, either through the cornea or sclerotica."[5]

2. *With the scissors.*—This method of operating, which originated with Janin[6], but was greatly improved by Maunoir[7], although more complicated in its manipulations than the methods of Cheselden and Beer, ensures more effectually the desired result; and, compared with the operation through the sclerotica, is actually more easy of performance. To divide the iris with Cheselden's scalpel, has often been found extremely difficult or even impossible, whereas with the scissors, the iris, in whatever state it may be, whether thin and unsupported except by aqueous humour in the posterior chamber, or

thickened, and perhaps adherent to the capsule, is divided with ease and certainty. Even in cases where the iris projects so as nearly to touch the cornea, M. Maunoir's operation can be performed with comparative facility. There is also much less risk of tearing the iris from the choroid than in Cheselden's method.

1*st Period.* — An incision, comprehending fully a fourth of the circumference of the cornea, is made at the distance of $\frac{1}{20}$ inch from its edge, and generally towards the temple. If the case is one in which the lens has previously been removed, the incision need not exceed a fourth; but if we contemplate the removal of a cataract through the artificial pupil, a greater extent of the cornea must be laid open. This may be done with the extraction-knife, or a small scalpel, of the same form as the iris-scalpel, but twice its size. The latter instrument is to be passed through the cornea at the point intended to form the upper extremity of the incision, and directed across the anterior chamber; then, as it is withdrawn, the cornea is to be ripped open to the requisite extent. If the extraction-knife is used, the incision is made in a similar way as in opening the cornea in the operation of extraction.

2*d Period.* — The scissors, with which the incision of the iris is to be performed, must be made with blades so thin and narrow, that when closed (*Fig.* 108.) they do not exceed the thickness of a small probe, the blades being about $\frac{3}{4}$ inch long, and bent so as to form an angle of 160° with the middle line of the handles. The blade, which is to pass between the iris and the cornea, is probe-

Fig. 108.

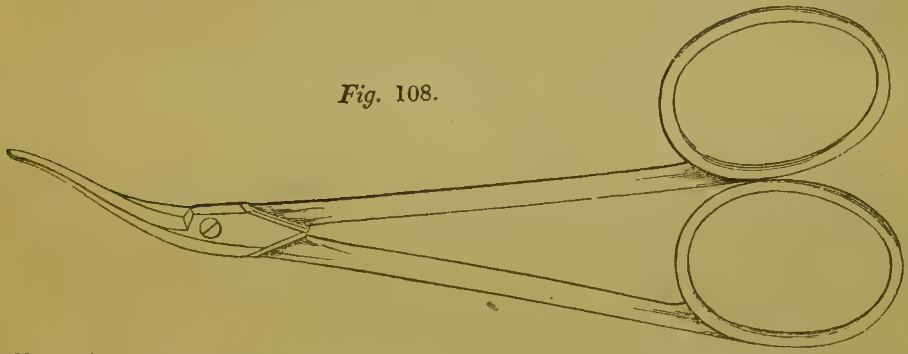
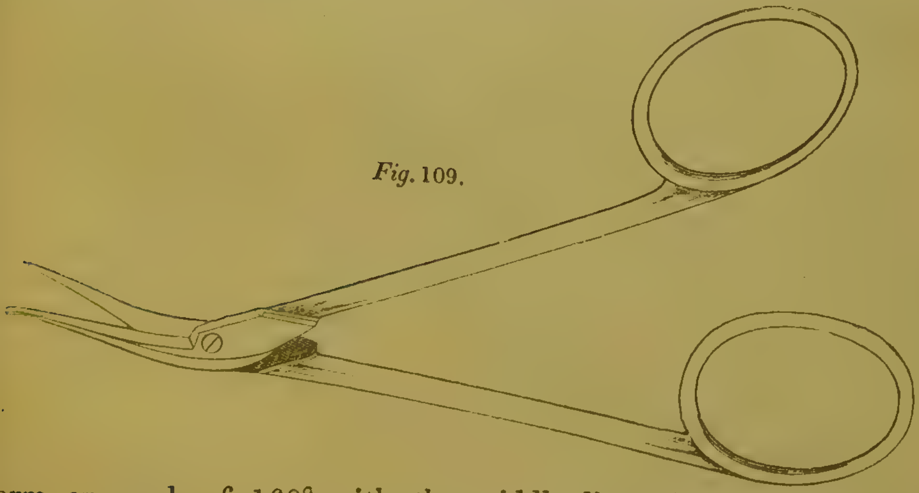


Fig. 109.



pointed; that which is to penetrate the iris is sharp-pointed, and about $\frac{1}{20}$ inch shorter than the other. (*Fig.* 109.)

The scissors are to be introduced, flat, through the wound of the cornea, till they reach the part of the iris where the incision ought to commence. They are then to be turned one quarter round on their axis, the handles brought a little forwards, the blades opened, the sharp-pointed blade passed through the iris, and the instrument worked across the eye, with the probe-pointed blade before and the sharp-pointed one behind the iris, as near to the nasal edge of the cornea as it is meant to extend the incision.

3*d Period.*—The scissors are now to be sharply closed, and the iris will be divided. Such is the method of operating with the scissors, when the radiating fibres of the iris are upon the stretch, as in cases of prolapsus after the operation of extraction; but in other cases, and especially when we suspect the substance of the iris to be thickened, or adherent to the capsule, it is proper to make two incisions (*Fig.* 110.), commencing at the same point, and divaricating from one another at an acute angle. The triangular flap thus formed shrivels up towards its base, leaving a permanent artificial pupil, generally of sufficient size, preserving sometimes a three-sided, but more frequently assuming a quadrilateral figure. (*Fig.* 111.)

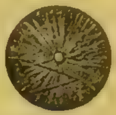


Fig. 110.

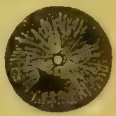


Fig. 111.

When closure of the pupil is combined with cataract, the incisions above described will lay open the capsule, and may even divide the lens, the fragments of which the operator ought to endeavour by gentle pressure to bring forward through the artificial pupil into the anterior chamber, whence they are to be extracted by means of the scoop, if they are soft, or the hook, if hard. It may sometimes be possible to extract even the capsule through the artificial pupil. If a portion of the capsule is firmly adherent to the triangular flap of the iris, it will shrink along with this, and form no obstacle to vision. Any fragments of the lens which may be left will gradually dissolve in the aqueous humour.

It is by no means indispensable that two incisions should be made, to permit the extraction of a cataract through the artificial pupil, formed by the scissors; nor is it necessary that the incision of the iris, in cases of closed pupil combined with cataract, should be transverse. Maunoir has recorded a case of capsulo-lenticular cataract with closed pupil, in which, having opened the lower part of the cornea, he penetrated the iris with the sharp-pointed blade of his scissors, at the distance of a line from its circumference, carried that blade behind the lens, closed the scissors, and thus cut through the lens, its capsule, and the iris in a vertical direction. The pupil immediately became larger. The two segments of the capsule were separated, and showed a broken lens of a bluish-grey colour, the capsule being yellowish-white. The lens was easily extracted, piece by piece, with the scoop. The larger segment of the capsule was then removed with forceps. The pupil, in form like that of a cat, now appearing of good size, the other fragment of the capsule was left, lest the taking of it away might have made the pupil too large.[8]

In cases of closure of the pupil from iritis, after an operation for cataract, Maunoir[9] opened the cornea at its lower edge, and passing his scissors into the anterior chamber, directed the sharp-pointed blade into the closed pupil, and behind the iris, the blunt-pointed one between the iris and the cornea; he then divided the iris by two radiating incisions, as is represented in *fig.* 112., whence immediately resulted, by the contraction of the sphincter and of the radiating fibres, a pupil of a quadrilateral form, as in *fig.* 113.

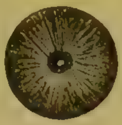


Fig. 112.

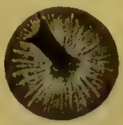


Fig. 113.

The same method he also followed, in cases of closure and displacement of the pupil, from prolapsus of the iris after extraction, making the incision for the introduction of the scissors through the cicatrice, and passing the sharp-pointed blade through the secondary cataract which occupied the pupil. On one occasion, he extracted the opaque capsule, partly in an ossified state, with forceps, after making the first incision through the iris; but the incision not expanding, he then made a second, and thus obtained a large pupil in the form of a parallelogram.

Incision with the scissors may also be practised when the iris is partially adherent to the cornea, as is often the case, in consequence of prolapsus through a penetrating ulcer, the natural pupil remaining partially open, and the lens and capsule transparent. Having supplied ourselves with a pair of scissors of the same dimensions as those above described, but with both blades probe-pointed and equal in length, we introduce them through a small section of the cornea, pass one of the blades within the contracted natural pupil, and conduct it behind the iris until we see that the other blade has reached the angle between the cornea and the iris. The latter is then to be divided by one or two incisions, running from its pupillary towards its ciliary edge. If one incision only is made, it will cut across the sphincter, and then pass between the radiating fibres, giving rise to a triangular extension of the pupil, as in *fig.* 115. If two incisions are made, they will form a triangular flap, the apex of which is in the natural pupil, and the basis behind the edge of the cornea, and which, by the shrinking at once of the sphincter and of the radiating fibres, will leave a large quadrilateral artificial pupil, similar to that represented in *fig.* 113. In this operation the capsule and lens ought to remain untouched; but it must be confessed, that there is more risk, in this way, of injuring those parts, than in the operation of lateral excision, which has therefore been generally preferred in such cases.

Similar incisions of the iris to those above described, through the sclerotica or through the cornea, may be accomplished with the cannula-scissors, and, if the self-penetrating pair be used, without any preliminary incision. Mr. Bowman remarks, that as "they enable us to make the pupil as central as possible, to define its extent, and to save the lens while present, and all this with a mere puncture of the cornea, they must supplant altogether the iris-scissors of Maunoir, which require a large incision in the cornea, do not enable the surgeon to limit the pupil as he desires, and are very apt to wound the lens."[10]

Case 653.—Mr. Bowman records a case in which a dense leucoma occupied the greater part of the right cornea; the lower edge of the pupil being adherent to the leucoma, its upper edge free and just visible above the leucoma. The cornea was slightly hazy above the leucoma, to nearly its upper margin. The lens appeared to be *in situ*, and perfectly clear.

Atropine having been applied so as to dilate the pupil a little, Mr. B. introduced the cannula-scissors at the outer side of the cornea, and, pushing them on as far as the pupil, passed the short or blunt-pointed blade behind the upper edge of the pupil, and the long or sharp-pointed blade in front of the iris. The trigger being pressed down, the blades closed and cut the upper margin of the pupil to the extent of about $\frac{1}{16}$ inch. *Figure* 114. shows the appearance of the eye before operation, the dark line near the edge of the cornea is the site of the puncture; and that extending from the pupil shows the incision by the scissors. *Figure* 115. represents the consequent enlargement of the pupil.

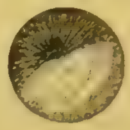


Fig. 114.

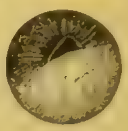


Fig. 115.

No blood flowed to discolour the aqueous humour; and the patient, on sitting up, could at once see the trees and distant houses through the window. No inflammation ensued.

About a month after, sight continued much improved; but as the patient stated that he saw more distinctly when the eye was shaded, and it was found that the pupil enlarged slightly upwards when that took place, Mr. B. repeated the operation, dividing the iris to a slightly greater extent, so as to place the pupil permanently in the condition in which it was thus found to serve most efficiently the purposes of vision.

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[1] Practical Observations on Ectropium, &c., p. 38.; London, 1812.

[2] Beer's Ansicht der staphylomatösen Metamorphosen des Auges, p. 105; Wien, 1806.

[3] Walton's Operative Ophthalmic Surgery, fig. 153, p. 589; London, 1853.

[4] Dixon, Lancet, June 25, 1853, p. 578: Estlin, Provincial Medical Journal; Vol. vi. p. 443; London, 1843.

[5] Op. cit. p. 444.

[6] Mémoires et Observations sur l'Œil, p. 191; Lyon, 1772.

[7] Mémoires sur l'Organization de l'Iris et l'Operation de la Pupille Artificielle; Paris, 1812: Scarpa, Trattato delle principali Malattie degli Occhi; Vol. ii. p. 118; Pavia, 1816.

[8] Medico-Chirurgical Transactions; Vol. ix. p. 287; London, 1818.

[9] Mémoires sur les Amputations, &c., p. 155; Genève, 1825.

[10] Medical Times and Gazette, January 10, 1852, p. 35.

SECTION VI. — EXTENSION OF THE PUPIL BY PROLAPSUS.

Syn.— Corectenia, from *κόρη*, *pupil*, *ἐκ*, *out*, and *τείνω*, *I stretch.*

The case just quoted is an example of extension of the natural pupil by incision. More frequently, extension has been effected by prolapsus, a method of operating founded on the fact, that in punctured wounds of the cornea (see p. 389.), the instantaneous escape of a portion of the aqueous humour is apt to be attended by a prolapsus of the iris, and a permanent diversion of the pupil in the direction of the wound.

When he purposes extending the natural pupil to behind some lucid portion of the cornea by prolapsus, the surgeon does not trust to the chance of a spontaneous protrusion of the iris, as soon as he makes a puncture near the margin of the cornea; but he provides himself with instruments with which he may, if necessary, extract a portion of the pupil. Of these, Tyrrell's blunt hook (*Fig.* 116.) and the cannula-forceps (*Figs.* 94 to 97., p. 840) are the most employed.

As an extemporaneous substitute for Tyrrell's instrument, an Anel's

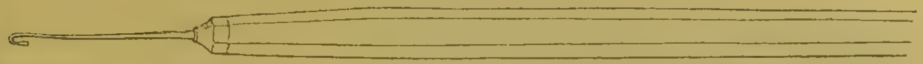


Fig. 116.

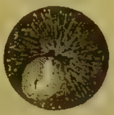
probe may be converted into a hook, and has the advantage of taking any particular bend we choose to give it.

Neither belladonna nor chloroform should be used in this operation, they being likely to counteract a protrusion of the iris.

If the iris is perfectly free, the cornea being punctured at the distance of $\frac{1}{20}$ inch from the sclerotica, and at its inner-lower edge rather than at any other part of its circumference, the broad cutting needle, or the extraction knife, with the point of which the puncture is made, should be turned a little on its axis, so as to favour a sudden and considerable gush of aqueous humour, and thus cause a protrusion of a portion of the iris. The extended pupil will generally take the shape of a triangular slit, its basis communicating with the natural pupil, and its apex extending to the puncture in the cornea.

A limited adhesion of the edge of the pupil to the cornea may not interfere with the extension of the pupil in the manner described, but if anterior synechia exists in a more considerable degree, or if the edge of the pupil be tagged to the capsule of the lens, a spontaneous prolapsus of the iris is not likely to happen, so that the hook or the forceps will be required to draw out a portion of the membrane.

Case 654.—*Figure* 117. shows the appearance of an eye affected with leucoma, and the pupil almost entirely adherent to the internal surface of the cornea. In the middle of the small part of the pupil which is free, there is a tag of adhesion. The patient was admitted at the Glasgow Eye Infirmary; and on the 22nd of July, 1853, Dr. A. Anderson, having made a puncture through the cornea at its outer margin, passed Tyrrell's hook behind the tag, and formed an artificial pupil, of an oval form (*fig.* 118.), by prolapsus, through which the patient enjoyed excellent vision.



Fig, 117.

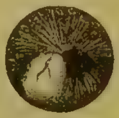


Fig. 118.

If the original pupil is quite obliterated by adhesion to the cornea, the needle used to puncture the cornea must be carried onwards within the anterior chamber, so as to pierce the iris close to its adhesion to the cornea. The needle is then to be suddenly withdrawn, without any rotation, in order to save as much as possible the aqueous humour, which aids us in conveying the hook through the anterior chamber without its being entangled in the iris.

The hook having entered the wound of the cornea, and being carried as far as the pupil, its bend is to be directed backward, and the margin of the pupil is to be caught by pressing the point gently towards the surface of the lens, at the same time that the instrument is cautiously withdrawn till it reaches the wound of the cornea. Here its exit would be impeded were we not to give it a quarter turn on its axis; but in doing this, it must not be allowed to recede from the wound, lest the iris should thereby slip from its grasp. It is then to be brought through the wound, and by its means a sufficient portion of the iris drawn out to effect the desired extension of the pupil. The prolapsed piece of iris is left to adhere to the lips of the cornea, and shrinks gradually so as not to be perceptible.

In cases of anterior synechia, the hook must lay hold of the iris at the place punctured with the needle, in the first period of the operation. In cases of posterior synechia, any part of the pupil which is open must be caught with the hook, the previous incision of the cornea being made in such a direction as shall be favourable for this being accomplished.

If no part of the pupil remains open, but the whole is adherent to the capsule, a small sharp hook, or the cannula-forceps, may be used for laying hold of the iris at the margin of the contracted pupil, and an attempt made to separate a portion of it from the capsule, and extract it. This can sometimes be accomplished only by tearing out a strip of iris.

SECTION VII. — ARTIFICIAL PUPIL BY EXCISION.

Syn. — Corectomia; from κόρη, *pupil*, ἐκ, *out*, and τέμνω, *I cut*.

Excision is either lateral or central. The latter, the invention of Wenzel, is now rarely practised; the former, first had recourse to by Beer, and afterwards by Gibson, is one of the most common modes of forming an artificial pupil.

§ 1. *Lateral Excision.*

It is a common practice, not to be content to leave the piece of iris, by the prolapsus of which an extension of the natural pupil has been effected, as described in the last section, to adhere to the wound of the cornea; but immediately to snip it off with the scissors, thus terminating the operation in a lateral excision. The operation of Beer and Gibson differed from that of extension of the pupil by prolapsus, ending in snipping off the prolapsed bit of iris, chiefly in their setting out with the intention, not of effecting a narrow chink merely, which they were afraid might close, but a pupil nearly circular, and of very considerable size, and this not through a puncture, likely to render difficult the subsequent manipulations, but a pretty free incision of the cornea, calculated to facilitate the completion of the operation. That too large a pupil is apt to be formed in this way, is undeniable. At the same time, the easiness of the process is likely always to recommend it, especially to those of limited experience in operating on the eye.

The necessary instruments are a knife, a hook or pair of small forceps, and a pair of scissors. The cataract-knife is the one generally employed, but I have often used a broad iris-scalpel for ripping open about a fourth of the circumference of the cornea, close to its edge. If the cataract-knife is employed, the incision is made as in opening the cornea in the operation of extraction. The hook or forceps is employed for dragging out a portion of the iris through the wound of the cornea, unless that membrane protrudes spontaneously, when the forceps is generally used for laying hold of the protruding portion, till it is snipt off with the scissors. Tyrrell's hook, from the length of its bend, seizes too much of the iris, and is therefore not suitable for the operation of excision. The cataract-hook (*fig.* 86., p. 800), or a blunt hook of similar curve (*fig.* 124.) answers better.

The operation divides itself, then, into three periods.

1*st Period.* The incision of the cornea rarely requires to exceed one-fourth of its circumference. The nasal and lower edge of the cornea is to be preferred, when the state of the parts permits the operator to choose the situation for the artificial pupil; but the temporal edge, being the most accessible, has been oftenest selected. Introducing the point of the iris-knife through the edge of the cornea, and as much across the anterior chamber as the state of the parts permits, the operator, as he withdraws the instrument, enlarges the incision to the requisite extent. If this is done so as to allow the aqueous humour to issue at once from the eye, the removal of the knife will generally be followed by a portion of the iris, projecting through the wound like a small bag. The incision must be close to the edge of the cornea, else it will be difficult to effect a prolapsus of the iris.

2*d Period.* If no spontaneous prolapsus takes place, the operator with the point of the scoop should open a little the wound of the cornea, at the same time making gentle pressure with the finger on the opposite side of the eyeball, when the iris will frequently appear between the edges of the wound, and may be laid hold of with the forceps. What is laid hold of is to be cautiously drawn out, care being taken to include the edge of the natural pupil in the portion thus prolapsed.

Should no protrusion of the iris take place on pressure, or should the edge of the natural pupil be adherent to the cornea in a considerable part of its extent, so that the iris is prevented from protruding, it becomes necessary to introduce either the hook or the forceps, lay hold of the iris, and cautiously drag out as much as may be sufficient for the formation of an artificial pupil of medium size. In doing this, care must be taken to avoid touching the crystalline capsule, which, in the cases where we have recourse to the operation of lateral excision, is generally transparent. We must also calculate with care the extent of iris which we are to extract; for if a very small portion only is drawn out, the operation may prove almost fruitless, from the minute size of the artificial pupil which will be formed; on the other hand, if a large portion is grasped by the forceps or extracted with the hook, the object of the operation may be equally frustrated by the weakness of sight attendant on too wide a pupil. The latter error is perhaps that into which the operator is more apt to fall. The snipping out of a flaccid bit of iris, apparently not larger than an ordinary pin-head, will sometimes form an artificial opening much beyond the medium size of the natural pupil. Removing too much of the iris is by far the more serious error of the two, inasmuch as it scarcely admits of any remedy, whereas, if the operator sees that at the first snip he has removed too little, he can either drag out and cut off an additional portion, or enlarge the pupil by incision with the scissors.

3*d Period.* The operator, holding with the one hand the piece of iris grasped between the blades of the forceps, with the other employs the scissors for snipping it off. During this period of the operation, it is evident that the lids must be committed entirely to the charge of the assistant. The operator should take care to have the scissors close at hand before laying hold of the piece of iris with the forceps, that he may not be obliged to search for them, in doing which he might readily drag out too much of the iris, or even separate a portion of it from the choroid. One of Beer's pupils invented an instrument for this operation, in which a hook and pair of scissors were combined, but which proved too complicated to be easily managed.

If any portion of the iris remains protruding through the wound, it is to be reduced with the scoop or the point of a small probe. The operator is now to rub gently the front of the eye through the medium of the upper eyelid, and then expose it to a pretty bright light, so as to ascertain somewhat of the form and size of the new pupil. (*Fig.* 103., p. 849.)

§ 2. *Central Excision.*

It is unnecessary to add anything to the account of Wenzel's operation, given at page 847. Both it, and its modifications by more modern operators, being objectionable on account of the extensive incision of the cornea which they require, are but seldom attempted. Mr. Travers, however, tells us, that he has repeatedly, and with perfect success, opened the cornea by a semicircular incision, raised the centre of the iris with forceps introduced under the flap of the cornea, and clipped off as large a piece of the iris as could be embraced by the convex scissors. He adds, that through such an opening, there will be no impediment to the passage of the lens.[1]

Dr. Stromeyer has invented a needle-knife, for making at once a section of the cornea, and cutting out an artificial pupil, which he describes in a pamphlet, entitled "Das Korektom," published at Augsburg, in 1842. The needle having transfixed the cornea, and permitted the aqueous humour to escape, the knife is pushed on and at once makes a section of the cornea, and cuts out a piece of the iris.

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[1] Synopsis of the Diseases of the Eye, p. 339; London, 1820.

SECTION VIII.—ARTIFICIAL PUPIL BY SEPARATION.

Syn.—Corodialysis; from *κόρη, pupil,* and *διαλύω, I loosen.*

§ 1. *Separation through the Sclerotica.*

The operation of forming an artificial pupil by separating a portion of the iris from the choroid, by means of a curved needle introduced through the sclerotica, is now almost entirely laid aside. Even when merely a small segment of the cornea remains transparent, with the iris adhering to the opaque part, and scarcely any anterior chamber existing, a case in which it is impossible to bring out any part of the iris through an incision of the cornea, it is not unusual to pass the needle with which the separation is to be attempted, not through the sclerotica, but through the opaque part of the cornea.

§ 2. *Separation through the Cornea.*

Assalini[1] and Buzzi[2] appear to have performed separation through the cornea, the former as early as 1787, with a small pair of forceps, and the latter with a needle, in 1788. In 1801, Schmidt[3] performed separation by means of a pair of forceps introduced through an opening in the cornea, but afterwards adopted separation through the sclerotica, as not endangering the transparency of the cornea. Himly[4] with a curved needle, and Bonzel[5] with a hook, also performed separation through the cornea. None of these operators, however, attempted to prevent by any particular means the return of the separated iris towards the choroid, an event which is extremely apt to happen, if, as is often the case, when an artificial pupil is required, the iris has previously suffered much from inflammation.

Langenbeck[6] was the first to whom it occurred to drag out, through the wound of the cornea, the portion of iris which is separated from the choroid, and by allowing the protruded piece to unite to the lips of the wound, to prevent in this way the obliteration of the new pupil. For effecting the separation, he at first employed a simple hook. On the ground, however, that a simple hook is apt, instead of separating the iris from the choroid, to tear it through, or to let it go after the separation is commenced, a variety of complicated instruments have been invented. One of these we owe to Dr. Reisinger[7], consisting of two delicate hooks laid side by side, which when shut (*Fig.* 119.) are no thicker than a common single hook. In this state they are introduced into the anterior chamber, but by their elasticity they separate from one another (*Fig.* 120.), and thus serve to lay hold of the iris at two different points, and, being again brought together, seize that membrane also as a pair of forceps.

In 1817, Langenbeck[8] invented an instrument for effecting the separation of the iris, consisting of a steel wire, terminating in a fine hook, which slides within a slender gold tube, the latter being fixed into one end of a thick silver tube, within which is a spiral spring. By means of a knob, the hook is protruded (*Fig.* 121.) in the same way as a pencil is pushed out of a pencil case. When the pressure on the knob is withdrawn, the spiral spring serves to retract the hook. The iris being laid hold of where it is attached to the choroid, the spiral spring is allowed to operate in effecting the separation, till the concave side of the hook presses the piece of iris, which it has transfixed, into contact with the end of the small gold tube. Thus the iris is fixed, so that it cannot escape during the rest of the operation, nor till it is fairly prolapsed between the lips of the wound of the cornea. This instrument requires a very small incision for its introduction, and is not apt to catch in the cornea as it is withdrawn.

Upon a similar principle, Gräfe formed[9] his corconcion or iris-hook, which, as improved by Dr. Schlagintweit,[11] is represented open in *Fig.* 122., and shut in *Fig.* 123. The hook is of steel. The sliding pinch, of silver, being moved forwards by the thumb applied on the ferrule which surrounds the handle of the instrument, comes in contact with the concavity of the hook, and so fixes the piece of iris which is laid hold of, that it cannot escape.

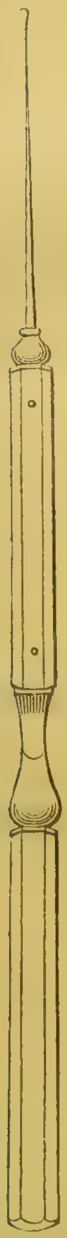
Fig. 119.

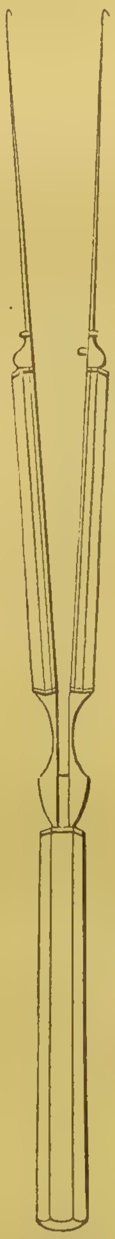
Fig. 120.

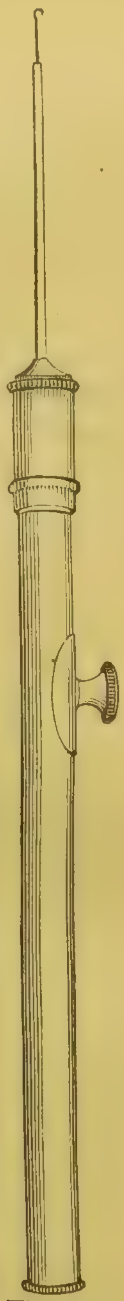
Fig. 121.

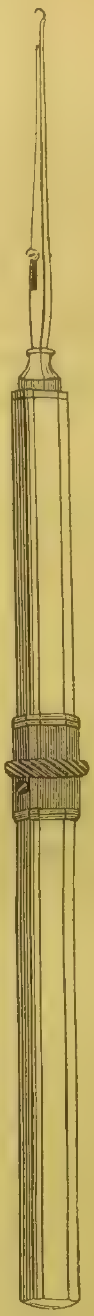
Fig. 122.

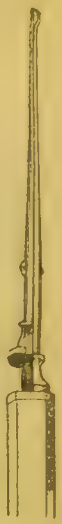
Fig. 123.

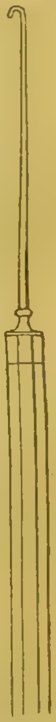
Fig. 124.

To act within the eye, Reisinger's hook-forceps require a larger incision; they are apt to separate too great a portion of the iris; and are sometimes difficult to bring out of the eye, from catching in the cornea. In all these respects, Schlagintweit's hook is preferable.

Dr. Jüngken, who took the trouble to publish a work on Gräfe's coreoncion, in a later publication[11] renounces the use both of it and of all other complicated instruments for effecting the separation of the iris, and recommends in cases where the texture of the membrane is healthy, a simple hook, and where it is changed by disease, a small pair of toothed forceps, such as that represented in *Fig.* 28., p. 219, but reduced in size. In either case, the canula-forceps might answer well.

The operation of separation divides itself into four periods; viz. *first*, the incision of the cornea; *secondly*, the introduction of the hook and laying hold of the iris; *thirdly*, the separation, properly so called; and *fourthly*, the strangulation of the separated piece of iris between the lips of the wound of the cornea.

1*st Period.* The situation of the incision through the cornea will of course vary with circumstances; but care must always be taken that it be neither too near nor too far from the edge of the cornea behind which the artificial pupil is to be formed. We shall suppose that this is to be done behind the nasal edge of a cornea, the transverse diameter of which measures $\frac{9}{20}$ inch. In this case, the incision should be made in a vertical direction, at the distance of $\frac{5}{20}$ inch from the nasal edge, or at any rate not nearer to that edge than the centre of the cornea. Were the incision nearer than this to the nasal edge, behind which we have supposed that the artificial pupil is to be formed, the separation of the iris would be too limited to form a pupil of sufficient size; and should an opaque cicatrice result from the incision of the cornea, this would probably extend over the new pupil, and frustrate the object of the operation. On the other hand, were the incision much farther from the nasal edge, the artificial pupil would be enormously large, in consequence of our continuing to detach the iris till a sufficient portion of it was drawn through the incision. But by making the incision at the distance of $\frac{5}{20}$ inch from the edge of the cornea behind which the separation is to be effected, the result is likely to be a triangular pupil of moderate size.

The incision will, in some cases, require to be made through a lucid portion of the cornea, and in others through one which is opaque. This is a matter of indifference, except only that we see better how to continue the operation when the part of the cornea which is opened is transparent. If Schlagintweit's hook or a simple hook be used, the length of the incision should equal $\frac{3}{20}$ inch; for if smaller it will be difficult, or even impossible, to effect through it the necessary protrusion of the iris. If Reisinger's double hook is used, unless the incision measure fully four-twentieths, it will not allow the instrument to open so as effectually to lay hold of the part to be separated. If, on the other hand, the incision is too extensive, the piece of iris which is protruded will not be strangulated with sufficient force by the lips of the incision, but will be apt to escape again into the anterior chamber, and return towards the choroid.

A double-edged knife has been recommended for making the incision, being pushed obliquely through the lamellæ of the cornea, and across the anterior chamber, till its point reaches the edge of the iris which is to be separated from the choroid. To make the incision of sufficient length, the knife, entering at the distance of $\frac{1}{20}$ inch from the edge of the cornea behind which the artificial pupil is to be formed, should have its cutting edges divaricating at an angle of 40°. Pushing, then, the point of the instrument slantingly through the cornea, it is to be carried through the anterior chamber, till it reach the angle between the cornea and iris, on that side of the eye where the artificial pupil is to be formed, and be immediately withdrawn. The incision will generally be vertical in its direction, when the pupil is to be either at the nasal or temporal edge of the cornea; and horizontal, if it is to be at the upper or lower edge; but it is not necessary that it should be always so, or parallel to the basis of the intended pupil. It may be oblique, as is shown in *Fig.* 125., where a simple hook is represented as introduced through an oblique incision, the lower edge of the iris being about to be separated.

The incision must not be made perpendicularly to the lamellæ of the cornea, but slantingly; else it will be difficult, if not impossible, to effect the protrusion of the separated piece of the iris.

2d Period. It is desirable that the sudden withdrawing of the knife, aided by the obliquity of the incision, should prevent the aqueous humour from being discharged till the hook is introduced, which the operator slides, flat, with its point turned downwards, along the surface of the eye, till it slips into the incision. He then carries it rather rapidly through the anterior chamber, till it reaches the angle between the cornea and iris, and is even a little way behind the sclerotica, so that it may be applied to that part of the iris which covers the ciliary processes. Pressing its convexity towards the cornea, and turning its point round towards the iris, the operator lays hold of the ciliary, edge of the membrane with the hook, which he then turns on its axis, till its point is directed upwards.

If Schlagintweit's hook is used, it is introduced shut; when it has reached the angle between the cornea and iris, the pinch is drawn back, the iris is seized, and the pinch is pushed on, so that the instrument is again shut. The iris is thus firmly grasped at a single point.

If Reisinger's double hook be used, the two branches of the instrument are to be pressed together, so that it is like a single hook. In this state, it is introduced as far as the edge of the iris, which is to be separated from the choroid. Having turned it round so that its points look towards the iris, the operator slowly relaxing his grasp of the instrument, allows its two branches to expand, and immediately lays hold of the edge of the iris with the two hooks, thus separated from each other. He next closes the instrument, so that the two hooks again approach each other, carrying the iris with them, and laying hold of it as with a pair of forceps. He then turns it on its axis till its points are directed upwards.

3d. Period. Very slowly the operator now draws the hook through the anterior chamber towards the incision of the cornea, carrying with it the iris, between which and the edge of the cornea he perceives the artificial pupil gradually formed. During this period, the instrument must be kept as close to the cornea as possible, in order to avoid any injury of the crystalline capsule; and as this is the most painful part of the operation, care must be taken to keep the patient's head steady, and to guard against his raising his hand to his eye. The pupil, as it is formed, fills with blood, so that it is often impossible to discern the state of the lens and capsule.

4*th Period.* The operator now requires to move the handle of the instrument, so that the convex edge of the hook or hooks may slip easily out of the incision; for if any difficulty occurs in bringing out the instrument, the operator is apt, in attempting to obviate it, to lose hold of the piece of iris which he has separated. The portion to be protruded rarely requires to exceed the size of a pin's head. (*Fig.* 126.) This, however, must vary in particular cases; for it sometimes happens, from the great extensibility of the iris, that the pupil will not be of sufficient size, unless the separation is continued even after the hook is brought out of the eye; while in cases where the iris is diseased in texture, and its extensibility thereby diminished, it is sometimes found difficult to effect a protrusion at all. The operator must be cautious of allowing the branches of the double hook to separate, or of letting go his hold of the iris, till he sees that he has fully accomplished this part of the operation, and that the protrusion appears to be retained by the lips of the incision; which will be done more effectually by carrying the protruded portion of the iris from the middle of the incision towards either of its extremities. The instrument is then to be freed from the protruding part of the iris.

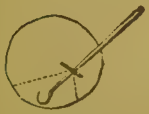

Fig. 125.

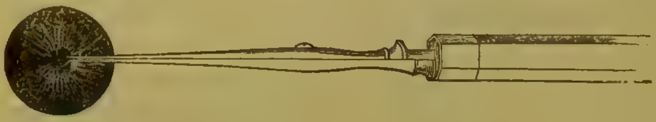

Fig. 126.

The portion of iris separated from the choroid when Schlagintweit's hook, or a simple hook, is used, is much less extensive than the portion separated by Reisinger's double hook. The form, therefore, of the artificial pupil, when the latter instrument is used, is that of an equilateral triangle; when the former is employed, the angle towards the incision is acute, or the artificial pupil may be little more than a chink, with its basis turned towards the margin of the cornea, a shape just the opposite of the pupil formed by prolapsus, and not nearly so favourable for vision.

The eye should instantly be shut, as soon as the hook is disengaged, in order, by the pressure of the lids, to assist in retaining the protruding portion of the iris. After a few minutes, the eye may again be opened, in order to ascertain the state of the prolapsus. Should this have disappeared, by the iris having retracted, which is not likely to happen unless the incision of the cornea is too large, the cannula-forceps ought to be introduced, the separated part again brought out, and, to ensure the object of the operation, the protruding portion snipt off with the scissors, thus combining excision with separation.

Should the application of the hook, single or double, not effect a satisfactory separation, but rather tear the iris, which is likely to happen only when its texture is softened by disease, the portion which is protruded will, in all probability, be too small to remain fixed in the wound of the cornea, and will be apt therefore to recede, the consequence of which will be that the pupil will be too small, and will in general be soon filled up by effused lymph. Reisinger recommends, therefore, under such circumstances, the excision of the protruded part of the iris.

When the fibres of the iris are in a state of unnatural tension previous to the operation, as may happen from there having been a former protrusion of that membrane through a wound of the cornea, or through a penetrating ulcer, the protruding of a portion of the separated iris may sometimes be dispensed with; as, in such a case, there is little or no danger of the iris returning towards the choroid.

When cataract co-exists with such changes in the cornea, or iris, as may demand the formation of an artificial pupil, and when we attempt this by the operation of separation, it will in general be useless, or even improper, to attempt anything for the removal of the cataract at the time of forming the artificial pupil. Extraction is plainly out of the question, and it would be better to defer division or displacement till the eye has recovered from so severe an operation as the separation of the iris from the choroid. Indeed, the flow of blood into the aqueous chambers is in general so great as to make it impossible for us to discern the parts behind the iris with sufficient distinctness to attempt any operation on the lens or capsule till that blood is absorbed.

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[1] Ricerche sulle Pupille Artificiali, p. 11; Milano, 1811.

[2] Ibid. p. 15.

[3] Ophthalmologische Bibliothek von Himly und Schmidt, Vol. ii. p. 31; Jena, 1803.

[4] Wagner de Coremorphosi, p. 36; Gœttingæ, 1818.

[5] Journal der practischen Heilkunde, von Hufeland und Harles, Januar, 1815, p. 47.

[6] Wenzl über den Zustand der Augenheilkunde in Frankreich und Deutschland, p. 107; Nürnberg, 1815.

[7] Darstellung einer leichten und sichern Methode künstliche Pupillen zu bilden, p. 29; Augsburg, 1816.

[8] Neue Bibliothek für die Chirurgie und Ophthalmologie; Vol. i. p. 454; Vol. ii. p. 106; Hannover, 1818, 1819.

[9] Das Coreoncion; ein Beitrag zur künstlichen Pupillenbildung, von Ch. Jüngken, p. 61; Berlin, 1817.

[10] Ueber den gegenwärtigen Zustand der künstlichen Pupillenbildung in Deutchland; München, 1818. Gräfe, after some time, endeavoured to improve his coreoncion, by splitting the hook into two, so as to resemble in some degree Reisinger's double hook. See Langenbeck's Neue Bibliothek; Vol. ii. p. 58.

[11] Lehre von den Augenoperationem, p. 656; Berlin, 1829

SECTION IX.—COMPOUND OPERATIONS FOR THE FORMATION OF AN ARTIFICIAL PUPIL.

1. I have already mentioned the combination of separation with excision, which has been recommended, when the separated portion of the iris is found to recede towards the choroid, or when it is too small to remain fixed in the wound of the cornea. In such cases,

there can be no question of the propriety of bringing out the separated portion of iris through the incision of the cornea, and removing it with the scissors.

2. Another compound operation was proposed by Donegana[1], namely, separation with incision, but which scarcely deserves to be particularly noticed. The instrument employed by him was a falciform needle, with which, introduced through the sclerotica, he first separated a portion of the iris from the choroid, and then endeavoured to divide the iris from its circumference towards its centre. The latter part of the operation it must be difficult to accomplish. Indeed, it is hardly possible, by the pressure even of the sharpest instrument, to effect a division of the iris, after separation has once commenced.

3. It is sometimes found advantageous to add incision to excision. Thus, in a case of extensive opacity of the cornea, with adherent iris, a segment at the lower edge of the cornea remaining transparent, I first formed an artificial pupil towards one extremity of the segment by excision, but regarding it as too small, instead of attempting an additional excision, I introduced Maunoir's scissors, and divided the iris transversely, so as to enlarge the artificial pupil to a medium size.

4. In a very interesting case recorded by Mr. Dixon[2], he first formed an artificial pupil by penetrating the cornea with a broad cutting needle, drawing out a small piece of iris with Tyrrell's hook, and removing it. The pupil turned out very small — a mere slit in the iris. In a subsequent operation, he therefore enlarged it, by catching its upper edge with the blunt hook, thus adding extension by prolapsus to excision.

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[1] Della Pupilla Artificiale; Milano, 1809.

[2] Lancet, June 25, 1853, p. 577.

SECTION X.—ACCIDENTS OCCASIONALLY ATTENDING THE FORMATION OF AN ARTIFICIAL PUPIL; AFTER-TREATMENT.

Many of the accidents which are apt to attend the formation of an artificial pupil are similar to those which accompany or follow the operations for cataract, and need not be particularly insisted on. A few, however, are peculiar.

1. On making a section of the cornea, for the purpose of forming an artificial pupil by excision or by separation, a portion of the vitreous humour is sometimes instantly evacuated through the wound, the hyaloid being in a weak state. This may happen even when the lens is transparent. Under such circumstances, it is not probable that the retina is altogether sound. The operation must be proceeded with as gently and as expeditiously as possible.

2. In whatever mode an artificial pupil is formed, blood is apt to be effused; more in separation, however, than in the other operations, especially when the iris is altered in texture from inflammation. In separation, the trunks of the blood-vessels which nourish the iris are torn across, while after long-continued inflammation, the iris is thickened and loaded with blood. The bleeding after separation, and some-

times after excision, is so considerable, that it goes on for a few minutes through the wound of the cornea. Filling the aqueous chambers, the blood prevents us from making any experiments regarding the degree of vision likely to be recovered by the operation. In 24 hours, in general, the pupil becomes clear. Indeed, it is remarkable with what celerity a large quantity of blood is sometimes absorbed from the aqueous chambers. (See p. 698.)

3. In attempting incision in Cheselden's method, the iris is liable to be torn away in part from the choroid, instead of being divided, or to be both divided and torn away. The accidental separation may take place at any part of the circumference of the choroid, but I believe it happens, contrary to what might have been expected, oftenest at the nasal edge. The pupil formed by the separation is likely to continue open, if the substance of the iris is pretty healthy, and thus the patient may have two artificial pupils. I have seen the one by incision close, and the one by separation remain open, and prove useful. It will as frequently happen either that no pupil is formed by incision when the iris separates in this way from the choroid, or that both pupils close from inflammation.

4. Little or no pain attends incision or excision; but it is otherwise with separation, owing to the tearing across of the ciliary nerves. The pain of separation is generally considerable, and sometimes severe, rendering necessary the use of opium after the patient is put to bed. During the operation the assistant requires to be on his guard, lest the patient suddenly moves away his head when he feels the pain, an accident which might lead to the separation of a much greater portion of the iris than the operator intended, or could be consistent with useful vision.

5. It sometimes happens in the course of an operation, that facts come to light, or circumstances occur, sufficiently pressing to make the operator change his determination in regard to the kind of operation he should perform. For instance, if he open the cornea with the view of forming an artificial pupil by incision with Maunoir's scissors, and the section of the cornea is instantly followed by protrusion of the iris, which I have seen happen even when the pupil was closed and its circumference adherent to the capsule, he should abandon the idea of incision, and form the new pupil by excision.

6. Should the operator find, that he has formed too small a pupil to be very useful, he ought immediately to enlarge it, either by repeating the operation which he has been performing, or by converting it into some of the compound operations described in the preceding section. It must be observed, however, that an artificial pupil will often appear small immediately after it is formed, and while the eye is drained of aqueous humour, which, after the eye becomes plump, will be found of fully a medium size. A pupil, formed by prolapsus with Tyrrell's hook will often present an appropriate size, provided the iris remains prolapsed; but if the prolapsed part be excised, and the iris being set free floats back into the aqueous humour, the pupil will often assume a size much too large.

7. When too large an artificial pupil has been formed, so that the eye is dazzled even by moderate light, it is necessary that the patient

should shade the eyes, or wear before the eye, in a spectacle-frame, a piece of pasteboard, light wood, or brass plate, concave within and convex without, blackened on both sides, and pierced in the centre with a slit, or a round hole of the size of the natural pupil. This will enable him to see at least all large objects; and often, with the aid of this contrivance, he will be able even to read.

8. The treatment of patients who have undergone an operation for artificial pupil, refers chiefly to the danger of inflammation coming on in the eye, and especially internal inflammation. The patient for some days must remain in bed, his eyes excluded from bright light, and his diet strictly antiphlogistic. Belladonna may be applied when the pupil has been formed by incision or excision, but ought to be avoided (at least immediately) after separation. Should pain in the eye, or round the orbit, supervene, venesection ought freely to be employed, followed up by the application of leeches. Calomel, with opium, ought instantly to be begun, in such doses as are likely speedily to affect the mouth, and continued till all danger of iritis seems past. The inflammation excited by an operation for artificial pupil often partakes of the scrofulous character, and not unfrequently is scrofulo-catarrhal. Depletion, in such cases, does not require to be carried to the same extent as when the inflammation is internal; and much benefit will be derived from the administration of the sulphate of quina.

9. The degree of vision recovered by the formation of an artificial pupil necessarily varies according to the condition of the eye before it was operated on, the kind of pupil which has been formed, and the effects of the operation on the various textures of the eye. If the lens has been removed, either before the formation of the artificial pupil, at the same time, or afterwards, cataract-glasses will be required. If the patient is short-sighted or long-sighted, but the lens entire, he will still be obliged to employ concave or convex spectacles. So far as any other sort of imperfect sight is concerned, no glass will be of any use to him.

It often happens, that those in whom an artificial pupil has been formed, present, in the first instance, but very dubious signs of sensibility of the retina; so much so, that the operator may be led almost to despair of a restoration to sight. I have known a fortnight to elapse, after all signs of inflammation had subsided, before the patient could tell one finger from another, and yet very tolerable vision be recovered.

10. A pupil behind the upper edge of the cornea is apt to be covered by the upper eyelid, and is never so useful as one placed behind any other portion of the cornea. A pupil behind the temporal edge obliges the patient to turn the side of his head forward, or to hold in a lateral direction the object he is looking at. In some measure to remedy these disadvantages, it might perhaps be advisable to divide the upper rectus in the former case, and the external rectus in the latter, so as to cause an artificial strabismus. This has been recommended[2], indeed, with an exaggerated estimate of its value, as a substitute for the formation of an artificial pupil, in cases of partial opacity of the cornea. In such cases, when the eye is turned much

to one side, either by a voluntary effort, or by a division of one of the recti, an oblique passage is afforded for the rays of light to strike the lateral part of the retina, and thus to produce an amount of indistinct vision, greatly inferior to that which is gained, under the same circumstances, by the formation of an artificial pupil. Constrained to remove a portion of the iris behind the upper or outer margin of the cornea, instead of very oblique vision, we may attain an approach to direct vision, by dividing one of the recti, and thus producing a permanent distortion of the eye.

11. The formation of an artificial pupil may appear to have succeeded perfectly; for example, by separation; but the case being complicated with cataract, a subsequent operation is necessary for the removal of the lens. This may also seem to have been successfully accomplished; by division, we shall say, through the cornea. Especially in scrofulous constitutions, the ultimate result is not unfrequently disastrous; the eye begins to show signs of atrophy, and ends in being soft and amaurotic.

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[1] Lancet, June 25, 1853; p. 577.

[2] Cunier, Annales d'Oculistique; Tome v. p. 200.; Bruxelles, 1841: Serre, Ib.; 1er Vol. Suppl. p. 122; Bruxelles, 1842: Bonnet, Traité des Sections Tendineuses, pp. 300, 308.; Lyons, 1841.

SECTION XI.—SCLERECTOMIA.

Fig. Ammon, Thl. I. Taf. IV. *fig.* 11—16. Taf. XVI. *fig.* 3.

This name is applied to the attempt which has sometimes been made to form an artificial pupil by the removal of a small portion of the sclerotica and choroid, in cases where the whole cornea is opaque, in the hope that the space might be filled up by a transparent membrane. As all such attempts have failed, I hold it unnecessary to do more than refer the reader to the works where he will find the details.[1]

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[1] Schmid de Pupilla Artificiali in Sclerotica aperienda; Tubingæ, 1814: Ammon, Zeitschrift für die Ophthalmologie; Vol. i. p. 109; Dresden, 1831: Wutzer, Ib. p. 486: Ullmann, Ib.; Vol. ii. p. 123; Dresden, 1832: Nimmo, Glasgow Medical Journal, April, 1833.

Akin to sclerectomia, is transplantation of the cornea; on which see Bigger, Dublin Journal of Medical Science; Vol. xi. p. 408: Steinberg de Transplantatione Corneæ, Berolini, 1840: Comptes-rendus de l'Académie des Sciences, 25 Septembre, 1843, p. 629; 16 Octobre, p. 817: Translation of this Work into French, p. xxii. Paris, 1844.

CHAPTER XXII.

ABNORMAL STATES OF THE IRIS, INDEPENDENT OF INFLAMMATION.

SECTION I.—MYOSIS.

From *μύω, I shut.* *Syn.*—Phthisis, Mydriasis, *Aretæus.* Iridoplegia pupillam contrahens.

Symptoms.—The pupil is very considerably below the medium size, perfectly regular, extremely limited and slow in its motions, scarcely dilating at all when the patient passes into a dark place, and yielding little even to the influence of belladonna. Both eyes are generally affected. The patient's vision is obscure, especially in weak light, in some cases he sees only during certain hours of the day, and when the myosis is complete, he is almost totally blind. The complaint is attended by pains in the head, especially in the forehead; and the subjects of the disease are, in general, debilitated or cachectic individuals. In a case of well marked myosis, I found, on dilating the pupils, the margin of the lenses marked by opaque radii.

Proximate cause.—The proximate cause is in fact unknown; but has been supposed to be, in some cases, of a spasmodic nature, and in others paralytic. Plenck admits a *spasmodic* myosis, accompanying hysterical and other nervous diseases, and attributable to spasm of the orbicular fibres of the iris; and a *paralytic* myosis, arising from palsy of the straight fibres, and attendant on other paralytic diseases.[1]

It is worthy of observation, that contraction is the natural state of the pupil during sleep.[2] Under the influence of a full dose of opium, also, the pupil becomes greatly contracted.[3]

The probability is, that myosis does not so much depend, in general, on any disease directly affecting the substance of the iris, as on some morbid change in the nerves by which this membrane is animated and excited to motion. In certain cases, myosis comes to be conjoined with amaurosis.

Experiments by Pourfour du Petit, and others, on the great sympathetic nerve and nervus vagus in the neck, showing that their division caused permanent contraction of the pupil of the corresponding eye, have brought physiologists to the belief, that while the nerves derived from the motor oculi give the stimulus for contraction of the sphincter, there are antagonistic nerves, sent to the radiating fibres of the iris, through the great sympathetic and the lenticular ganglion, from the cervical portion of the spinal cord, by means of which the pupil is excited to expansion.[4] This view of the matter would point to some affection of the spinal nerves, as the source of myosis. Romberg mentions, that in tabes dorsalis he had found the pupil contracted to the size of a pin's head.[5]

Exciting causes.—Frequent and long-continued employment of the eyes in the examination of minute objects, especially of those which reflect the light strongly, induces an habitual contraction of the pupil; and this ends in an inability of this aperture to expand, even when the eyes are exposed to feeble light. Those who read or write much by candle-light, embroiderers, watchmakers, setters of jewels, and the like, are thus exposed more than others to myosis.

Treatment.—The few well-marked cases of this disease which have fallen under my observation, appeared to be scarcely at all benefited by any mode of treatment. Temporary dilatation of the pupil by belladonna, contrary to what might have been expected, only increased the weakness of sight by which the myosis was accompanied, showing that the disordered condition of the iris is not the whole disease, but only a part of it. Antispasmodic and antiparalytic remedies are recommended in the treatment of this disease; but probably more good will be effected by carefully guarding against the exciting causes of the disease, than by medicines of any kind. The eyes should be shaded; reading, writing, and similar laborious occupations of the sight, should be avoided; exercise in the country should be enjoined; and the patient should retire to rest at an early hour.

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[1] De Morbis Oculorum, p. 120; Viennæ, 1777. The same notion was promulgated by Mauchart, in his dissertation De Pupillæ Phthisi.

[2] Fontana dei Moti dell' Iride; Lucca, 1765: Janin, Mémoires et Observations sur l'Œil, p. 8; Lyon, 1772: Cuvier, Leçons d'Anatomie Comparée; Tome ii. p. 409; Paris, 1805.

[3] Taylor on Poisons, pp. 581, 582, 584; London, 1848.

[4] Valentin de Functionibus Nervorum, p. 109; Bernæ, 1839.

[5] Manual of the Nervous Diseases of Man; Vol. ii. p. 299; London, 1853.

SECTION II. — MYDRIASIS.

From ἀμυδρὸς, *obscure*. *Syn.* — Platycoria, *Aretæus*. Iridoplegia pupillam expandens.

Abnormal dilatation of the pupil is styled *mydriasis;* the iris no longer expanding, even although the eye be directed to a near object, or exposed to a bright light. Very frequently, this is merely one of the symptoms attending certain kinds of amaurosis; such as, the hydrocephalic. In other cases, it accompanies palsy of the muscles stimulated by the motor oculi. (See p. 346.) Slight divergence of the affected eye, and a degree of diplopia, when both eyes are open, indicate that the rectus internus is involved, as well as the iris. Occasionally mydriasis occurs independently of any other affection, and when this is the case, the dilatation is sometimes to such a degree, that only a narrow rim of iris remains in view. Of course, in this state of the pupil, vision is so much dazzled by the uncontrolled influx of light, that the patient is unable, especially in broad day, to turn the affected eye steadily towards any object, or to discern anything with it distinctly. Near objects especially appear dim and confused. By looking through a hole in a card, however, the dazzling effect of too much light is prevented, spherical aberration is again obviated, and the vision of the eye labouring under mydriasis is greatly improved. In many cases, the improvement is such that the patient is able to read; and this fact constitutes one of the chief grounds of diagnosis between the sympathetic dilatation of the pupil which attends amaurosis, and idiopathic mydriasis. A convex glass also compensates for the want of power to accommodate the eye to the sight of near objects, and enables the patient to read; but some to do this require both a convex glass and the perforated card. Demours hád never seen mydriasis in both eyes. This agrees with general observation, although in some rare instances both eyes are affected. Sometimes the disease passes from the one eye to the other[1], or shows itself periodically.

Causes. — Different species of idiopathic mydriasis have been distinguished by authors; such as, the *paralytic*, arising from palsy of the sphincter of the iris, and the *spasmodic*, from spasm of the straight fibres. The mydriasis which follows the application of belladonna, and some similar narcotics, and of which advantage is taken in the treatment of inflammation of the iris, and during the performance of certain operations for cataract, is generally regarded as a paralytic affection of the fibres of the ciliary nerves, derived from the third nerve; and that this, and not stimulation of the great sympathetic, is the cause of mydriasis, appears probable from the fact, that this affection is so frequently present in palsy affecting the whole of the third nerve. An occasional cause of mydriasis is the passage of a large cataract through the pupil in the operation of extraction. Preternatural distention is supposed in this instance to give rise to atony of the iris, which, generally after a few days, wears off, so that the pupil contracts to its former diameter. Blows on the eye, blows or falls on the head[2], and incised or lacerated wounds of the brow or temple, sometimes induce mydriasis, without any affection of the optic nerve. It is rarely the case, that any signs of cerebral disorder attend simple dilatation of the pupil. When it originates from excess in venery, such signs are present. Sometimes mydriasis is complicated with neuralgia in the branches of the fifth nerve, especially the supraorbitary branch.[3] Mr. Ware observes, that most of the persons with mydriasis whom he had seen had been debilitated by fatigue or anxiety before the disease of the eye was discovered; and that in some it had been preceded by affections of the stomach and alimentary canal. I have known it occur in a dyspeptic subject, after exposure, in a railway carriage, to a draught of cold air. Not unfrequently, it appears connected with a rheumatic diathesis, and yields to anti-rheumatic treatment.

To mydriasis, amaurosis is sometimes superadded. In other cases, amaurosis has been known to attack an eye which had been cured of mydriasis.

Whatever view we adopt regarding myosis, that mydriasis depends on some peculiar change affecting the third nerve, and operating through the ophthalmic ganglion, and ciliary nerves, is more than probable.

We are indebted to Dr. Wells and Mr. Ware for two interesting cases of mydriasis.

Case 655. — Dr. Wells was consulted by a gentleman, about 35 years of age, very tall, and inclining to be corpulent, who, about a month before, had been attacked with a catarrh, and as this was leaving him, was seized with a slight stupor, and a feeling of weight in his forehead. He began at the same time to see less distinctly than formerly with his right eye, and to lose the power of moving its upper lid. The pupil of the same eye was also observed to be much dilated. In a few days, the left eye became similarly affected with the right, but in a less degree. Previous to this ailment, the patient's sight had always been so good, that he had never used glasses of any kind. On examining the eyes, Dr. Wells could not discover in them any other appearance of disease than that their pupils, the right particularly, were much too large, and that their size was little affected by light. At first, he thought that their dilatation was occasioned by a defect of sensibility in the retinæ; but he was quickly obliged to abandon this opinion, as the patient assured him that his sensation of light was as strong as it had ever been during any period of his life. Dr. Wells next inquired whether objects at different distances appeared to him equally distinct. He answered, that he saw distant objects accurately, and, in proof, told what the hour was by a remote public clock; but he added, that the letters of a book seemed to him so confused, that it was with difficulty he could make out the words. He was now desired to look at a page of a printed book, through convex glasses. He did so, and found that he could read it with ease. "From these circumstances," observes Dr. Wells, "it was very plain, that this gentleman, at the same time that his pupils had become dilated and his upper eyelids paralytic, had acquired the sight of an old man, by losing suddenly the command of the muscles by which the eye is enabled to see near objects distinctly; it being known to those who are conversant with the facts relating to human vision, that the eye in its relaxed state is fitted for distant objects, and that the seeing of near objects accurately is dependent upon muscular exertion."[4]

Case 656. — Mr. Ware has recorded the case of a lady between 30 and 40 years of age, the pupil of whose right eye, when she was not engaged in reading or in working with her needle, was always dilated very nearly to the rim of the cornea; but whenever she looked at a small object nine inches from the eye, it contracted, within less than a minute, to a size nearly as small as the head of a pin. Her left pupil was not affected like the right; but in every degree of light and distance was contracted rather more than is usual in other persons. The vision was not precisely alike in the two eyes; the right eye being in a small degree near-sighted, and receiving assistance from a shallow concave glass, whereas the left eye derived no benefit from it. The remarkable dilatation of the pupil of the right eye had existed for 20 years. A variety of remedies had been employed at different times to correct it, but none of them had made any alteration.

Mr. Ware mentions particularly, that, in order to produce the contraction of the dilated pupil in this case, the object looked at required to be placed exactly nine inches from the eye. If it were brought nearer, it had no more power to produce the contraction than if it were placed at a remoter distance. It was also observed, that the continuance of the contraction of the pupil depended in some degree on the state of the lady's health; since, although the contraction never remained long after the attention was withdrawn from a near object, yet whenever the patient was debilitated by any temporary ailment, the contraction was of much shorter duration than when her health was entire.[5]

Prognosis. — Demours[6], who appears to write on mydriasis fully more from experience than most authors, pronounces rather a favourable prognosis in this disease. He says, that unless it has been the effect of a contusion or serious wound of the eye, he has generally seen it yield one half in the space of the first six months, even in those who employed no means of cure. What remains of the disease disappears much more slowly. He had witnessed complete restoration of the pupil to its natural size, even after a contusion of the eye, although in such cases recovery is extremely rare. The result of his observations was, that seven cases out of nine proceed towards recovery, even without any treatment, a statement to be regarded, in weighing the alleged influence of remedies; and that little more can be done than to accelerate the cure, chiefly by external stimulants.

Treatment. — When the patient shows signs of congestion in the head, and is of a robust frame of body, blood-letting, general or local, and a spare diet, with alterative doses of mercury, followed by purgatives, form the line of treatment to be pursued.

In rheumatic cases, small doses of calomel and Dover's powder prove useful; also the wine of colchicum. Ammoniated tincture of valerian has been of service, from half a drachm to a drachm being given thrice daily. In weakly subjects, bitter tonics ought to be prescribed.

The brow and temple should be rubbed morning and evening with a stimulating liniment, or with tincture of nux vomica. Blisters to the forehead and temple ought to be employed; and it may be proper to dust the raw surface with from $\frac{1}{10}$ to $\frac{1}{2}$ grain of strychnia. Mr. Guthrie recommends veratria as an efficient remedy, six to eight grains being dissolved in an ounce of spirit, with which the upper eyelid and forehead are to be painted.[7] Small electric sparks may be alternaltely drawn from, and directed against, the eye, and the surrounding parts, for a few minutes daily; or one pole of the electro-magnetic machine may be applied to the forehead, while the other is made to touch the eyeball.

Ergot of rye, taken in doses of from three to twenty grains, three times a day, or the same substance used as snuff, has been recommended. In some cases, its effects appear to have been remarkably advantageous; in others null.[8]

Demours remarks, that if any acrid liquid is dropped upon an eye affected with mydriasis, even although the dilatation of the pupil has been carried to the utmost degree, that aperture instantly contracts nearly one half, and the patient recovers for a minute or two the power of seeing such minute objects as previously he had been able to distinguish only by looking through a hole in a card. We have no specific for causing contraction of the pupil, possessing a property the opposite of what exists in belladonna. It does not appear, then, to be of much importance, what stimulating fluid is chosen for the purpose of producing a temporary contraction of the pupil. Even water has the effect in some degree. Wine of opium, pure or diluted, is oftenest used, being dropped upon the eye once or twice a-day. A similar preparation of aconite, is likely, from what has been observed in toxicological experiments, to have a considerable, yet by no means specific, effect.[9]

M. Serre, of Uzès, has ventured to treat mydriasis, by the application of nitrate of silver to the cornea, near its junction with the sclerotica. In a memoir presented to the Royal Academy of Medicine, he related four cases in illustration of the success of his method, and the committee of the Academy to whom the subject was referred, found the application of the caustic, in the manner directed by M. Serre, efficacious in three other instances. The caustic is applied only for a second. It produces redness of the external vessels of the eye, followed by a copious secretion of tears and of the nasal mucus, with smart pain in the forehead and cheek. The slight cloud which appears on the cornea, in consequence of the application, rarely continues, we are told, above a few days. The cylinder of caustic, filed down to the form of a pencil, is intended, I presume, to touch only a single point of the conjunctiva; yet even this limited application, although only for an instant, may be followed by violent irritation.[10]

A safer mode of stimulating the iris to contraction, is that employed by Dr. Fronmüller, and which consists in making the patient read, for a certain period every day, with the affected eye, through a convex glass, beginning with one of the longest focus which renders the print distinct, say of 12 or 14 inches, and gradually passing, as the pupil gains in power of contraction, to those of a still longer focus, till the disease is completely removed. The stimulation, in this mode of cure, is applied to the retina, and being conveyed to the brain is reflected from it to the third nerve and to the ciliary nerves.[11]

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[1] Bowman, Medical Times and Gazette, June 23. 1853, p. 91.

[2] Brodie, Medico-Chirurgical Transactions, Vol. xiv. p. 354; London, 1828.

[3] London Medical Gazette; Vol. xxii. p. 68.

[4] Philosophical Transactions; Vol. ci. p. 378; London, 1811.

[5] Ibid; Vol. ciii. p. 36; London, 1813.

[6] Traité des Maladies des Yeux; Tome i. p. 444; Paris, 1818.

[7] Medical Times, March 9, 1844, p. 409.

[8] Kochanowski, Archives Générales de Médecine, Novembre, 1838, p. 351: Comperat, London Medical Gazette, September 8, 1848, p. 435: Mc Evers, Dublin Quarterly Journal of Medical Science, November, 1848, p. 484: Bowman, Op. cit. p. 92.

[9] Fleming's Inquiry into the properties of Aconitum Napellus, pp. 21, 32; London, 1845.

[10] Archives Générales de Médecine; Tome xvii. p. 307; Paris, 1828.

[11] Annales d'Oculistique; Tome xxiv. p. 197; Bruxelles, 1850.

SECTION III. — TREMULOUS IRIS.

Syn.—Iridodonesis. From ἶρις, *iris*, and δονέω, *I shake.*

The cases in which the iris is affected, on every movement of the eye, with a peculiar tremulous or undulatory motion, are various, and by no means unfrequent. In some, the waving motion is striking; in others, it is seen only when the eye is considerably moved, and even then it may be so slight, that it must be watched to be detected. The texture of the iris, in such cases, is apparently uninjured, and the pupil generally of its natural form; but the membrane seldom appears to retain any power of contracting or expanding. I have seen it, however, from sympathy with the pupil of the other eye, which was healthy, move briskly and extensively.

A tremulous state of the iris is frequently, but not necessarily connected with amaurosis. We meet with it combined with cataract, and especially with capsulo-lenticular cataract. It is extremely apt to follow an operation for the removal of capsulo-lenticular cataract. I have seen it follow the most successful extraction of a common lenticular cataract, without affecting vision in the slightest degree. It often results from a blow on the eye, and in this case is generally attended by a partial or complete insensibility of the retina, and opacity of the lens. I have seen it arise from a small accidental wound of the sclerotica and choroid, immediately behind the edge of the cornea; also, from the puncture made for the extraction of a secondary capsular cataract through the sclerotica, the ciliary muscle and processes being probably wounded, from approaching too near to the edge of the cornea. In the last-mentioned case, vision did not seem to suffer. In those born amaurotic, or affected with congenital cataract, tremulousness of the iris is often met with; and in such subjects, it is attended by oscillation of the eyeball. (See p. 384.) When this disease of the iris is combined with cataract, the latter not unfrequently partakes of the tremulous motion, and after a time is likely to sink, from the vitreous humour being dissolved. After operations for cataract on eyes, the vitreous humour of which has been previously dissolved, or from which a considerable quantity of the vitreous humour is lost at the operation, the iris frequently presents this undulatory motion.

In almost all cases of tremulous iris, there appears to be a larger quantity of the aqueous fluid in the posterior chamber than natural; and in many of them, the whole cavity behind the iris is filled with fluid, in consequence of destruction of the hyaloid tissue. The iris hangs loose, and is unable to resist those undulations of the aqueous humour which take place whenever the eye is turned from side to side. It is then only, in fact, that the tremulousness of the iris is perceptible. We do not observe it so long as the patient fixes his attention on the same object, nor does the attempt to accommodate the eye to objects placed at a variety of distances, but in the same right line, appear to produce the motion in question.

This affection of the iris has hitherto been regarded as incurable, and certainly it affords an unfavourable index of the state of the vitreous humour, and must make us suspicious also of the retina.

CHAPTER XXIII.

GLAUCOMA AND CAT'S-EYE.

SECTION I. — GLAUCOMA.

Syn.—Γλαύκωμα and γλαύκωσις, from γλαυκὸς, *blue*, *green*, or *grey*: because of the bluish, greenish, or greyish appearance of the pupil. Der grüne Staar, *Ger.* Diplochromatism of crystalline lens.

Fig. Beer, Band II. Taf. IV. *fig.* 2. Taf. III. *fig.* 5. Band I. Taf. III. *fig.* 1. Weller, Tab. II. Ammon, Thl. I. Taf. X. *figs.* 13, 18, 19, 24. Taf. XV. *fig.* 1. Dalrymple, Pl. XXIII. Sichel, Pl. XXV. *figs.* 3, 4.

Distinctive Character. — The distinctive character of glaucoma is a green or greenish colour of the pupil.

Definition. — It is not easy to give a definition of glaucoma; for this reason, that although the peculiar green appearance seen behind the pupil, whence the disease is named, is an invariable character in its early stages, the symptoms which follow embrace a great variety of different phenomena, or perhaps, more correctly, the collateral phenomena are so many different diseases, with which glaucoma, strictly so called, is combined. Unfortunately, the collateral diseases are often of an obscure nature, whence arises the difficulty of moulding this subject into something like consistency.

Nosological History.—It is evident that Hippocrates comprehended, under the term *glaucoma*, every sort of opacity which appears behind the pupil. Thus, in enumerating the diseases to which man is exposed at different periods of life, he mentions, along with others to which old age is subject, ὀφθαλμῶν καὶ ῥινῶν ὑγρότητες, ἀμϐλυωπίαι, γλαυκώσεες, καὶ βαρυηκοΐαι[1], evidently employing the term γλαυκώσεες to signify rather a class of diseases than any single affection of the transparent parts of the eye. The appearances arising from effusion of lymph into the pupil, or what we now term *spurious* cataract, are no doubt very different from those presented by capsular or lenticular opacity; and these, in their turn, are, in general, readily discriminated from those opacities which seem to be situated still deeper in the eye. We, who have the advantage of knowing, by dissection, the differences of these three kinds of disease which affect the transparent media of the eye, need not be surprised that they were not accurately distinguished by the father of medicine, who, though he did not fail to observe that the κόραι γλαυκούμεναι presented various colours and forms in different cases, that this class of diseases of the eye arose from a variety of causes, and that some of these diseases were more destructive of vision than others[2], had probably enjoyed no opportunity of ascertaining, after death, the nature of those changes upon which the γλαυκώσεες depend; nor had he the advantage of knowing that some, at least, of these diseases could be removed by operation, and in this way vision be restored..

It is uncertain by whom, or at what period, the term ὑπόχυμα or ὑπόχυσις was first employed to signify a particular species of opacity behind the pupil. That it had, in a great measure, superseded the generic appellation employed by Hippocrates, is evident from the manner in which Celsus introduces this subject to our notice, and from his total omission of γλαύκωμα or γλαύκωσις. "Suffusio quoque," says he, "quam Græci ὑπόχυσιν nominant, interdum oculi potentiæ qua cernit, se opponit."[3] *Suffusio*, here, is nothing more than a translation of ὑπόχυσις, and expresses the conjectural and unfounded notion which the Greeks had adopted regarding the nature of cataract. They did not know that this disease is, in general, nothing more than a change in the transparency and colour of a natural part of the eye, namely, the crystalline lens. On the contrary, they had been taught (probably by Herophilus), that the lens was the immediate organ of vision;[4] and, therefore, they were led to ascribe the disease, which they found to prevent vision till it was removed by surgical operation, to the effusion of a new substance between the iris and the lens.

Although the diversity of opacities which occur behind the pupil had either not attracted the attention of Celsus, or was deemed by him unworthy of notice, or had not been particularly insisted upon by the Greek authors from whom he copied, the later Greeks were well aware that the opacities seen through the pupil were very different in different cases, and that only some of them were susceptible of cure by operation.[5] Those which were generally incurable they distinguished by the name of γλαυκώματα, while on the more favourable they bestowed that of ὑπόχυματα. They also came to the conclusion, that the former set of opacities depended on a change of colour and consistence in the crystalline lens, an opinion from which the moderns have erroneously departed; but that the latter were to be attributed to a morbid accumulation between the iris and the crystalline, a notion which the moderns have successfully corrected. Abundant proof could be brought that these were the doctrines of Galen[6], and even of Rufus[7]; and, if it were necessary, we might trace them through the writings of Oribasius, Aëtius, Paulus, Actuarius, and a crowd of others, down to the time of Brisseau. Even Maître-Jan, to whom we are in a great measure indebted for establishing, by dissection, the fact that cataract is, in general, an opacity of the crystalline lens, and not a filmy substance between that body and the iris, still maintained that glaucoma also was a disease of the lens — "une altération toute particulière du cristallin, par laquelle il se desséche, diminue en volume, change de couleur et perd sa transparence, en conservant sa figure naturelle, et devenant plus solide qu'il ne doit être naturellement."[8]

Preceded by Lasnier, Rolfink, Borel, and others, in the discovery that the most common kind of cataract has its seat in the crystalline lens (a discovery, however, which he confirmed by many valuable observations), Brisseau[9] appears to have been the first to announce to the profession the opinion, which from that day to this they have almost universally adopted, that, while cataract or ὑπόχυμα was an opacity of the lens, γλαύκωμα was a similar affection of the vitreous humour — an opacity deeply seated in the eye, frequently of a bluish or greenish colour, and visible through the transparent lens. He had been led to this opinion partly from what had been detected on dissecting the eyes of Bourdelot, physician to Louis XIV., who, having been the subject of a disease pronounced to be cataract, left orders that his eyes should be examined after death, in order to throw some light, if possible, on the much agitated question, whether cataract was a film occupying the posterior chamber, or an affection of the crystalline body. The dissection was performed by Maréchal. The lens in the right eye, with which, for many years, the patient had been scarcely able to distinguish light from darkness, was found to be totally opaque; its exterior lamellæ were less solid than the interior, forming, as it were, a whitish membrane of about half a line's thickness, which included a nucleus of more solid consistence, and of a yellowish colour. Immediately behind the fossula, which contained the lens, the vitreous humour was also opaque, to the depth of more than a line, and tinged of a yellow colour, although not to the same degree. The left eye, with which Bourdelot had continued to see with tolerable distinctness, had begun to be affected in a similar way; for the lens had already lost much of its natural transparency, and the vitreous humour in contact with it, was slightly yellow. Brisseau drew the conclusion from this dissection, that in such cases the complication of diseases would necessarily render abortive any attempt to restore sight by operation; that although the lens were couched, the opacity of the vitreous humour would still continue, and be sufficient to impede the passage of the rays of light to the retina. He considered himself, also, justified in claiming for this opacity of the vitreous humour the name of *glaucoma*.[10]

Brisseau, moreover, having demonstrated to his full satisfaction that cataract was an opacity of the lens, was naturally led to the conclusion that the vitreous humour was subject to a similar affection, from the well ascertained fact, that the loss of sight attendant on the disease called glaucoma was incurable by operation, which he thought could not have been the case had it consisted, as was generally pretended, in a desiccation and change of colour of the lens. He reasoned that had glaucoma resided in the lens, it would have been cured by the operation of depression; but as it was notorious that this operation did not cure the blindness which accompanies glaucoma, he concluded that it was a disease of some other part of the eye. He fixed upon the vitreous humour as its seat; partly vindicated, no doubt, in doing so, by the above mentioned dissection by Maréchal. Brisseau was not aware that the chief cause of the loss of sight in glaucoma resides neither in the lens, nor in the vitreous humour, but in the retina.

The generality of modern authors have adopted, without hesitation, the doctrine that glaucoma is a disease of the vitreous humour. They speak of it as an opacity of the hyaloid membrane, or of the fluid therein contained, and some of them as an inspissation of the latter; as the following extracts show:—

"Quando s'intorbida anchè l'umor vitreo nel glaucoma, malattia gravissima dell' occhio, spesso l'iride o non si muove più, o appena si muove. . . . Nel glaucoma, se tutto l'umor vitreo divenne opaco, perchè i raggi non passano più, l'iride non si muove punto, o poco, se pochi raggi vi possano passare."—*Fontana*.[11]

"Sæpenumero nimis spissum, tenax et obscurum est hoc corpus vitreum, et jam parit *glaucoma*."—*Voit*.[12]

"Glaucoma obscurationem humoris vitrei et membranæ hyaloideæ exhibet."—*Fabini*.[13]

"In some cases the vitreous humour acquires a dull-greenish colour, accompanied with insensibility of the retina, a species of amaurosis which has generally been called *glaucoma*."—*Wardrop*.[14]

Professor Jüngken states[15] glaucoma to be a cloudiness of the vitreous body, caused by exudation, the product of chronic inflammation of the hyaloid membrane. He says that the retina always suffers along with the vitreous body, whence the concomitant appearance of amaurosis with glaucoma. He tells us, that glaucoma is characterized generally by a gray-greenish sea-coloured cloudiness in the bottom of the eye, remote from the pupil, and appearing concave. He notices only one variety of the disease, and never hints at any other seat of the complaint than the vitreous body.

Professor Rosas, in his latest work[16] on diseases of the eye, distinguishes three kinds of glaucoma; viz. one of the hyaloid, another of the retina, and a third of the choroid. He makes no mention of the lens, which, however true it is that other textures are involved in the disease, is always the seat of that change, which gives rise to the greenish appearance behind the pupil.

Distinctions.—I have already (pp. 560, 570, 571.) had occasion to mention the occurrence of glaucoma in cases of arthritic iritis, and in acute and chronic choroiditis, in all of which cases there is reason to think that the lens is already affected with the peculiar change which constitutes glaucoma, before attention is directed to the condition of the humours the eye and of vision, by the supervention of one or other of those ophthalmiæ. The patient suddenly becoming blind in acute choroiditis, and the eye presenting a green reflection behind the pupil, the name *acute glaucoma* has sometimes been employed. The disease we are now about to consider is, in contradistinction, designated as *chronic glaucoma*. It is of frequent occurrence, is in its early stages attended by no external signs of inflammation, and being slow in the progress which it makes in changing the appearance of the dioptric media of the eye, and invading the perfection of vision, is apt to be confounded with cataract.

Subjects. — Glaucoma is a disease which does not occur except after middle age. Dark-eyed persons are more liable to it than those the colour of whose iris is blue or gray. The subjects of glaucoma are often myopic. They often labour under the symptoms of irregular gout, and not unfrequently have long suffered from those pains in the teeth and head which are generally accounted rheumatic.

Stages:—Glaucoma comprehends a series of morbid changes, which, in general, develops itself only in the course of years, to involve at last all the structures of the eye.

1*st stage.* The earliest appearance of glaucoma is merely a greenish hue, reflected from behind the pupil, and, as is shown by the liveliness of the iris and the sensibility of the retina, not necessarily connected with any material deterioration of vision. The nucleus, or central laminæ, of the lens have become not merely of the yellowish hue which pervades the whole substance of the crystalline in advanced life, but of a reddish or brownish amber colour.

2*nd stage.* A muddy green colour of the crystalline marks the second stage; and along with this there is sluggishness of the pupil, and more or less obscurity of vision. The pupil is not dilated, nor irregular. If there is any change in the consistence of the eyeball, it is rather firmer than natural. This stage may last for five or six years, or more, vision declining by insensible degrees all the time, but without pain or external redness of the eye. The reddish or brownish amber colour, which in the first stage was confined to the nucleus, gradually pervades the whole laminæ of the lens. Vision is thereby impeded nearly as in cataract; but there is little or no coagulation of the lenticular substance, little or no white infiltration between the fibres of the lens, such as exists in cataract. A most important fact regarding this stage of glaucoma is, that it may or may not be attended by amaurosis. If not so attended, it constitutes the *cataracte lenticulaire verte opérable* of M. Sichel.

3*rd stage.* An abnormal hardness of the eye, with immobility and unequal dilatation of the pupil, a varicose state of the external, and probably of the internal, blood-vessels, and a still more marked loss of sight, are signs of the third stage. The patient now complains of the frequent occurrence of a cloud over his sight, continuing for hours or days, of sensations of fiery and prismatic spectra, alternating with fixed muscæ, of intolerance of light, and of pain in and round the eye. In this stage the choroid is inflamed; effusion taking place from its internal surface, the retina is compressed; the vitreous tissue is disorganised, and a superabundant watery secretion comes to occupy its place. For a time, the eye may continue sensible to objects placed to one or other side of the patient, while in every other direction nothing is distinguished. At length, the retina becomes totally insensible.

4*th stage.* In the fourth stage, the crystalline becomes cataractous as well as glaucomatous. Hitherto of a horny, muddy green, hue, its surface slowly or suddenly becomes of an opaque white colour. (*Cataracta viridis, vel glaucomatosa,* Beer.) The lens also appears augmented in thickness, and, pressing forwards through the pupil, it at length touches the cornea. The edge of the pupil sometimes appears rolled back into the posterior chamber; in other cases pressed forwards, and fringed with the uvea. The iris is changed in colour, its texture appears thinned, its fibrous structure is no longer discernible, and patches of it, as Mr. Wardrop mentions[17], seem eroded. Varicose vessels are observed traversing its surface, and red spots, as if from effused blood, form between the iris and the cornea. The sclerotica becomes attenuated, and a choroid staphyloma sometimes rises abruptly on the surface of the eye. Perception of external light is totally lost, but the patient is still affected with sensations of flashing in the eye, from pressure on the retina.

5th stage. In the fifth stage, the cornea, irritated by the projecting and hypertrophied lens, appears hazy and rough, and is partially infiltrated with blood; it inflames, and gives way by ulceration; the lens, softened and opaque, escapes from the eye, and the vessels of the iris and choroid bleed profusely through the ruptured cornea.

6th stage. The sixth stage presents the eye quiet and atrophied. This state may ensue even without bursting of the cornea; the inflammatory symptoms subsiding of themselves, and the contents of the eyeball undergoing absorption, so that it shrinks to less than its normal size; and, instead of the preternatural hardness which it formerly presented, becomes boggy, and sinks into the orbit.

These different stages of glaucoma run insensibly into each other. Although the disease is scarcely at any period of its course amenable to treatment, it is no uncommon thing for it to be spontaneously arrested in one or other of these stages, and to make no further progress. It often remains stationary in the first stage for a great part of life; the lens is glaucomatous or diplochromatic, but vision is not materially impeded. Under the second stage, it often happens that as the amber-coloured degeneration proceeds insensibly towards the surface of the lens, from year to year the vision becomes more and more imperfect, without the other textures of the eye being involved. The patient has perhaps been told that cataract is forming in his eyes, and that by-and-bye he will be in a condition for undergoing a cure by operation; but both the patient and the practitioner are apt to get bewildered in their notions when they find, that, instead of a few months, as was anticipated, five or six years, or perhaps twice that time, passes away, with little apparent increase in the visible opacity, and a declension of vision, the progress of which is imperceptible.

In the first and second stages, glaucoma is generally a disease of the crystalline alone. I say *generally*, for sometimes amaurosis accompanies glaucoma from the very commencement, or even precedes the visible changes which afterwards take place in the dioptric media of the eye. I have known the disease to set in with fits of iridescent vision, followed by insensibility of the retina, and after a time by diplochromatism of the lens. In its advanced stages, glaucoma presents symptoms depending on certain morbid conditions of almost every texture of the eye. The elements, in which glaucoma consists, when far advanced, reside in the lens, the vitreous humour, the retina, the choroid, the iris, the sclerotica, the bloodvessels of the eye, and even in the cornea and conjunctiva. The order in which these different parts become affected is not invariably the same, nor the proportions in which they take part in the complex disease.

The anomalous appearances, too, which we occasionally meet with in glaucoma are numerous. One of these implicates the epidermis of the cornea. The cornea having become semi-opaque, its epithelium is separated from it by a fluid, and rises in the form of an irregular vesicle. The fluid may be pushed from one place to another of the cornea, under the detached membrane. (See p. 690.) A very curious appearance, which I saw in one case, was that of bloodvessels proceeding from within the pupil, bending themselves outwards, and ramifying over the inner surface of the cornea.

Diagnosis. — The appearances presented by the eye in the early stages of glaucoma are calculated to lead the observer to conclude, that he is looking through a transparent lens at an opaque vitreous humour. There is a muddiness, or cloudiness within the eye, but he feels a difficulty in deciding what part is affected. The opaque appearance is more distinct when the pupil is regarded directly: it disappears when viewed obliquely, being the opposite in this respect to an optical phenomenon, which I have known to puzzle, namely, that which arises when the light, falling obliquely on the eye, is concentrated by the cornea, and again reflected from the surface of the lens behind one or other edge of the pupil. The opacity, in glaucoma appears to be more deeply seated than the lens; more so, however, in the commencement of the disease than after it has continued for some time. Indeed, in the earliest stage, the greenish reflection appears to come almost from the bottom of the eye. As the disease advances, the apparent opacity, always of a greenish colour, and often sea-green, is seen as if occupying the centre of the vitreous humour, and at last appears to be immediately behind or in the posterior part of the lens.

If the pupil of a glaucomatous eye is small, the appearances are particularly apt to impose on the inexperienced practitioner for those of cataract. The colour, however, of the glaucomatous eye is sufficient to prove that the case is at any rate not one of simple lenticular cataract. A green cataract is always attended with glaucoma. On dilating the pupil by belladonna, the green appearance presented in simple glaucoma seems to retire to a greater depth behind the iris, and to become more circumscribed. The other diagnostic symptoms I have fully considered at p. 741. I have also explained there the catoptrical signs of the early stages of glaucoma.

There is a traumatic affection of the eye, which bears a strong resemblance to glaucoma.[18] The injuries which cause the affection in question are generally severe; such as, a penetrating wound of the cornea, or a blow with the fist. Iritis comes on, and in a few days the pupil becomes of a fine sea-green colour. I suspect this state depends on a lymphatic or purulent deposition immediately behind the lens.

Pathological anatomy.—It is remarkable how very few and imperfect are the accounts of the dissections of glaucomatous eyes, which have been recorded either before or after the time of Brisseau. The reader will at once perceive how little could properly be concluded from the dissection of Bourdelot's eyes by Maréchal. A single instance, however striking it might be, and well authenticated, could not warrant a general conclusion. It is not even stated, however, that Bourdelot's eyes had ever presented, at any period of his life, the symptoms of glaucoma; so that had not Brisseau been led by arguments of another sort, it is very unlikely that he would have drawn anything from a fact so insulated and incomplete.

I had long felt anxious to ascertain, by dissection, the changes which the eye undergoes in glaucoma, and being favoured, some time ago, with several eyes in this state, I carefully examined them. The following are the particulars which I observed in the greater number of cases.

1. The lens of an amber, or yellowish-brown colour, especially in and behind its nucleus; its consistence firm; and its transparency perfect, or nearly so. In some cases, however, the yellowish-brown colour of the nucleus and lamellæ immediately posterior to it was so deep as considerably to impair the transparency of the lens. The part in question was also drier than natural.

2. The vitreous humour in a fluid state; perfectly pellucid; colourless, or slightly yellow. No trace of hyaloid membrane.

3. The choroid coat, and especially the portion of it in contact with the retina, of a light brown colour, with little or no appearance of pigmentum nigrum.

4. In the retina, no trace of limbus luteus, or foramen centrale.

To the first of these changes, namely, the amber or yellowish-brown colour of the lens, and especially of its central lamellæ, I attribute the peculiar appearance of the deep-seated parts of the eye in glaucoma. Indeed, in some incipient cases, an amber colour of the lens was the only change I could detect on dissection. The glaucomatous lens, viewed in its natural situation, seems of a greenish, sometimes of a deep sea-green, colour. Taken out of the eye, all greenness is gone, both within the eye deprived of its crystalline, and in the lens under examination. On being viewed against the light, the lens is found of a deep amber colour. In glaucoma, then, the lens has become, in a certain sense, diplochromatic. The lens, and the vitreous humour, which is also often yellowish in glaucoma, have the power of analysing the incident light, absorbing the violet, blue, and red rays, leaving the yellow and green rays but little affected, so that they are dispersed, whence results the apparently green appearance of the humours.

It is well known that various substances, natural as well as artificial, present a different colour, according as they are seen by reflection or by refraction. Thus, a bit of gold leaf, viewed by reflected light, is yellow, and green when viewed by transmitted light. The glaucomatous lens is the reverse of this. Seen within the eye by reflected light, it appears green; seen out of the eye by transmitted light, it is of an amber, or yellowish-brown colour. Numerous other examples might be mentioned of the same or a similar phenomenon.[19]

There is no green surface in the human eye directly to reflect the green rays, such as exists in the tapetum of the eye of the sheep. It appears, then, to be from an absorption of the extreme prismatic rays, as the light passes through the eye, that a greenish reflection is produced; and the part most likely to affect the light in this way is the lens. In confirmation of this, if the lens is extracted, or if it sinks to the bottom of the dissolved vitreous humour, the glaucomatous or green appearance in the eye is lost. This I saw very distinctly in a patient whose case I have already related. (See *Case* 253, p. 400.) Having extracted in this case a glaucomatous lens, which a blow had brought into the anterior chamber, and the appearance of which, viewed by transmitted light, is represented in Plate II., fig. 2., the pupil of the injured eye became perfectly black, while the opposite pupil presented the usual appearance of advanced glaucoma.

The dissolved state of the vitreous humour, which my dissections of glaucomatous eyes lead me to consider as generally forming part of this disease, is always attended, at least in the middle stages of glaucoma, by an abnormal firmness of the eye to the touch, evidently arising from an over-distention of the tunics.

In one case of glaucoma, I observed the lens tremulous. It was not opaque or cataractous. Its tremulousness I detected by the evident motion of a lucid point behind the pupil, changing its situation on every movement of the eye.

The patient with glaucoma, in the second stage, and commencement of the third, sees ill, partly from the retina being unsound, partly from the pigment of the choroid being unable to absorb the rays of light, partly from the light not being freely transmitted by the central dark-coloured portion of the lens; but still he sees, and often continues to do so for years after the glaucoma has become observable, a sufficient quantity of light for the perception of objects being transmitted through the circumferential portion of the lens.

If an attempt be made to displace the lens in the second, third, or fourth stage of glaucoma, on touching it with the needle, it is apt to sink unexpectedly to the bottom of the vitreous humour; if extraction is attempted, the same event sometimes takes place, so as to frustrate the object of the operation, and the eye is drained by the loss of dissolved vitreous humour. Even when extraction is conducted with great caution, or performed, perhaps, through a small section of the cornea, a large quantity of this fluid is apt to escape.

The lens, simply glaucomatous, or in the state of glaucomatous cataract, and left to itself, may remain for many years *in situ*, notwithstanding the dissolved state of the vitreous humour, by the zonula Zinnii, or suspensory ligament of the lens, still preserving its adhesion to the ciliary processes; at length, however, this adhesion may give way, when the lens will suddenly drop to the bottom of the eye, as in the case of cataract already quoted (p. 836.) from Mayerne.

Dissections of glaucomatous eyes in the advanced stages of the disease, after inflammation of the choroid has complicated the affection of the dioptric media, have been recorded by Eble[20], Rosas [21], and Warnatz [22], and exhibit a considerable variety of morbid changes in the different structures of the eye.

The sclerotic adhering to the choroid, and this to the retina; the bloodvessels of the choroid enlarged, and especially its veins varicose; ossifications in the choroid; adhesions of the iris to the capsule of the lens, and to the cornea; the retina spotted with red punctiform exudations, thickened, softened, atrophied; the vitreous body shrunk; the hyaloid abnormally firm in some places; fibrinous effusions, effusions of a reddish fluid, greenish-brown depositions within it; the crystalline in a softened and opaque state: these are the chief changes observed on dissection.

I have now before me one of the eyes of the patient whose case I have noticed at page 741. The disease, which I have stated was mistaken for cataract, ended in total loss of vision from glaucoma. On dissection, scarcely any trace of the natural structure of the interior of the eyes was to be detected. The choroid, inseparably adherent to the sclerotica externally, was internally so connected to the contents of the eyeball, and these so changed by fibrinous exudation, that the retina could not be distinguished. In this, as well as in another case which I had an opportunity of examining after death, the optic nerves were flattened and atrophic.

Proximate cause. — Respecting the cause of the alteration in the lens we can say nothing satisfactory. The lens may be regarded so far as a secretion, and the alterations which it undergoes as dependent on the state of the organ by which it is secreted. Its nutrition, as well as that of the vitreous humour, is derived unquestionably from the capillaries of the ciliary body; and from morbid alterations in the condition of these vessels, or of the blood which they convey, arise in all probability those departures from the normal state, to which we give the names of cataract and glaucoma. Chronic inflammation of the choroid and retina, specific but obscure in its character, may, perhaps, be the cause which leads to the destruction of the hyaloid membrane, which, in its turn, is likely to produce a series of other local changes, even in the very organs which were originally affected. It is probable that the aqueous fluid, which fills the place of the vitreous humour, becoming superabundant, promotes, by pressure, the absorption of the pigmentum nigrum, and completes the insensibility of the already disordered retina.

Although it can scarcely be doubted, that the epithelium of the choroid fulfils but a subsidiary part in the exercise of vision, yet it is evident that without the aid of the pigmentum nigrum, it is impossible for a due impression to be produced upon the retina. The fact that the eye of the albino, in which the cells of the pigment are congenitally destitute of colouring matter, is unable to discern objects with distinctness in the ordinary light of day, is sufficient to prove the necessity of a healthy condition of the choroidal epithelium for a due performance of the function of the eye.

Exciting and predisposing causes. — The Germans appear to consider glaucoma as almost always connected with arthritis, or rather as the result of slow arthritic inflammation of the eye, and especially of the choroid.

Similar causes to those which lead to arthritic iritis, and to choroiditis (see pp. 561, 571, 572), appear to operate in the production of glaucoma, and especially anxiety, grief, and loss of sleep.

The cachectic state of the system arising from the habitual use of spirits and tobacco operates powerfully in the production of glaucoma. This disease also appears to be more apt to occur in those who have been scrofulous in childhood, or who have exerted their eyes much on minute objects, or such as reflect the light with intensity.

It is not easy satisfactorily to explain the frequency of glaucoma in some countries, and in certain classes of society, and its rarity in others. Thus, Benedict tells us, that one half of the glaucomatous patients whom he had seen during 12 years' practice in Breslaw, were Jews, among whom he states glaucoma to be extremely common.[23] Scarpa, on the other hand, has not thought it necessary to introduce the subject of glaucoma into his treatise on the diseases of the eye. It is also remarkable that, in one of his letters to Maunoir, he mentions, that during the long series of years in which he filled the anatomical chair at Pavia, he had never, in dissection, met with dissolution of the vitreous humour, and that after reading Sir William Adams' work, published in 1817, he made at least 40 eyes be examined, of persons who had died between 60 and 80 years of age, without finding the vitreous humour either wholly or partially dissolved in one of them.

Prognosis. — When glaucoma has commenced in one eye, it generally extends also to the other. We often see the disease in different stages in the two eyes.

Fully developed glaucoma is absolutely incurable; but remedies may occasionally arrest the progress of the disease, and, under certain circumstances, even improve the impaired vision.

Treatment. — 1. On the presumption that glaucoma originates in an inflammatory affection of the choroid and retina, bleeding and purging have been employed for its cure, and occasionally this practice has been attended with benefit. Counter-irritation, also, has been found useful, especially a tartar emetic eruption between the shoulders.

2. Calomel, with opium, has been given, on the principle that in almost all cases of deep-seated inflammation of the eye, mercury proves salutary. As is the case in arthritic ophthalmia, with which glaucoma is certainly allied, an alterative course will prove more beneficial than if the mercury were pushed so as to affect the mouth. Indeed, it is evident that from the age and constitution of those who are in general the subjects of glaucoma, neither depletion nor mercurialization can, with propriety, be employed, without more than ordinary caution.

3. Rest of the eyes, a mild diet, a healthy state of the skin, and abstinence from alcoholic fluids, and tobacco in every form, must be enjoined.

4. Anti-neuralgic remedies, such as tincture of belladonna taken internally in doses of from 10 to 15 minims, or Fleming's tincture of aconite in doses of 3 or 4 minims, thrice a-day, are of much use in alleviating the pain, which often attends the disease.

5. Arthritic inflammation of the eye is often greatly benefited by

the use of tonics; as precipitated carbonate of iron, sulphate of quina, and the like. After depletion, such remedies may be also tried in glaucoma.

6. Dilatation of the pupil by belladonna improves the vision of most glaucomatous eyes in the second stage of the disease, and may be employed day after day as a palliative. The most convenient mode of application is a solution of atropine dropped upon the conjunctiva every second evening. Some, however, find their sight dazzled, and a new degree of mistiness produced, by dilatation of the pupil, which, of course, we must abandon, if followed by such effects.

7. As a superabundance of dissolved vitreous humour appears to form an essential part of the morbid changes observed in the advanced stages of glaucoma, it is not unreasonable to conclude that occasionally puncturing the sclerotica and choroid might prove serviceable, by taking off the pressure of the accumulated fluid on the retina. The puncture should be made with a broad iris-knife at the usual place of entering the needle in the operation of couching. The instrument, pushed towards the centre of the vitreous humour, is to be turned a little on its axis, and held for a minute or two in the same position, so that the fluid may escape. A transient amelioration of vision, as well as relief from pain, is sometimes the result of the operation, or even of that of puncturing the cornea, and evacuating the aqueous humour.

8. The abstraction of the crystalline lens from a glaucomatous eye removes the greenish appearance of the humours, and sometimes improves the vision of the patient. At the same time, although I am persuaded that the absence of the lens might be advantageous in the early stages, and prevent, in a considerable measure, the progress of the amaurosis which comes to accompany glaucoma, extraction is an operation which I would by no means, venture to recommend for general adoption. The patient, in the second stage, generally continues for a long period to see too much, to warrant our exposing him to the danger of arthritic inflammation coming on after any operation. I have known glaucoma operated on for cataract; that is to say, the amber-coloured lens removed by extraction, the operator apprehending that he was removing an opaque or cataractous lens; and I have seen the incision, after such an operation, heal without inflammation, and the patient receive a considerable accession of vision. But I have also known such violent inflammation follow the removal of the lens from a glaucomatous eye, as entirely destroyed the natural structure of the most important parts of the organ. There is reason to suspect that glaucoma has often been operated on with the needle, the disease being mistaken for cataract; and that the general result of couching or of division was fatal to vision.

That the early removal of the lens might prove a means of preventing glaucoma, and not merely the lenticular, but the retinal part of the disease, is a conclusion to which I was naturally led by the following case:—

Case 857.—R. C., aged 48 years, applied to me in March, 1820, in consequence of impaired vision of the left eye, which already presented a glaucomatous appearance. In his right eye, there was a capsular cataract, the result of an injury 40 years before, which had been followed by absorption of the crystalline lens. The vision of the left eye rapidly declining, while evident perception of light and shade was still retained by the right, I opened the cornea of this eye, and drew the capsule out of the pupil and partially between the lips of the incision of the cornea, leaving it to adhere there, and thus securing a passage for the rays of light into the interior of the eye. As good vision was restored by this means as generally follows an operation for cataract; and the patient was able, with his right eye assisted by a cataract-glass, to follow his usual employment for some years. The vision of the left eye became still more impaired, under signs which appeared to me indubitably those of glaucoma and amaurosis. The patient, however, was persuaded that he had a cataract in this eye, and urged me to operate on it. This I declined; but I recommended the patient, since he still had doubts about the matter, to consult the late Dr. Monteath. He did so, and felt greatly disappointed when Dr. M. only confirmed the opinion which I had previously given him. Not yet satisfied, he went to Edinburgh, where he unfortunately met with encouragement in the notion of his eye being affected with cataract, and accordingly underwent an operation, which was followed only by violent and destructive inflammation.

It struck me, in reflecting on this case, that the total absence not merely of glaucoma, but of amaurosis in the right eye, was owing to the lens having been absorbed at an early period of life; for glaucoma is a disease, which, under ordinary circumstances, rarely attacks the one eye without speedily affecting the other also. The absence of the lens may have operated also in preventing the disease of the hyaloid membrane, which ends in its destruction, and to which I feel inclined, so far as our present evidence goes, to attribute in a considerable measure, the origin of the affection of the retina which attends glaucoma.

The second stage of glaucoma is the only one in which the removal of the lens can be defended. The pale muddy green opacity behind the pupil, more deeply seated than the opacity in ordinary cataract, so that, owing to the transparency of the superficial laminæ of the lens, the iris throws a broader shadow on the opacity than when the surface of the lens is affected; the consistence of the eyeball natural; the iris healthy in texture; the pupil not abnormally dilated; no inverted image visible, while the deep erect image forms a large yellow blaze; vision such as attends lenticular cataract; the progress of the disease much slower than that of lenticular cataract, occupying as many years, generally, as a common cataract does months, to become ripe for operation; these are circumstances which enable us to pronounce the disease to be glaucoma in the second stage, and vision likely to be restored by the removal of the lens. This last is an important fact, because practitioners are apt to conclude, when they see a green opacity behind the pupil, that the case is one of amaurosis, as well as change in the refracting media of the eye. Hence patients are left as incurable, to whom the removal of the glaucomatous lens might restore vision. In the cases in question, a careful examination, shows that vision is not extinguished, but that the eye retains nearly the same degree of sight as does a cataractous eye; the eyeball is not hard and stony to the feeling, as it is in the third stage, when, to a glaucomatous state of the lens, there is added a dissolution and accumulation of vitreous humour; the sclerotica is not thinned, so as to allow the choroid to shine through; nor are the blood-vessels of the eye enlarged and varicose, as in the advanced and hopeless stages of the disease.

It sometimes happens, however, that incomplete amaurosis attends the second stage of glaucoma, as was the case in the right eye of the patient whose case I am about to relate, and then the operation proves fruitless.

Case 858.—Robert Shaw, a weaver, aged 56, was admitted at the Glasgow Eye Infirmary, January 14th, 1841, with lenticular opacity in each eye, of a pale muddy greenish hue, confined apparently to the central and posterior portions of the lenses. Vision of right eye, in which the opaque appearance is the more advanced, so much impaired that he cannot distinguish objects with it. Vision of left eye also imperfect, but with it can still distinguish the fingers. Pupils of natural size; their motions limited and sluggish. Eyeballs of normal consistence; deep set in orbits. Sight began to fail four or five years ago, after having had typhus fever followed by erysipelas. Has never been myopic nor presbyopic, as far as he knows.

15th. Extract of belladonna was applied yesterday, since which he thinks his vision less distinct.

Feb. 1st. With left eye can discern characters an inch in height. Right eye almost insensible, except to light and shade. Opacity of lenses so far advanced that no inverted image is visible on examining eyes catoptrically.

Sept. 12th. Opacity, still of the same muddy green colour, has slowly advanced towards the iris. Has been till lately employed as a house-factor, but cannot see to continue this employment.

28th. Right pupil being dilated by belladonna, curved needle introduced through sclerotica, and anterior capsule divided.

29th. An attack of pain last night, for which he was bled, and had a calomel and opium pill. Belladonna continued to right eyelids. Pill to be continued morning and evening.

Oct. 1st. Pills to be omitted.

Nov. 6th. Curved needle again introduced through right sclerotica, and capsule and lens divided.

7th. Was bled this morning, on account of pain in right eye, and had four grains of calomel and one grain of opium.

17th. A very fine straight needle introduced through left sclerotica, with the view of displacing the lens, in the manner recommended by Mr. Morgan, in Guy's Hospital Reports, Vol. vii. p. 461. This not being effected, the anterior capsule was divided, and the needle withdrawn. Belladonna to be applied to left eyelids.

Dec. 10th. Division of left capsule repeated with curved needle passed through sclerotica, and the comminution extended partly to the lens.

Feb. 2nd., 1843. Left pupil being dilated by belladonna, capsule and lens again divided with curved needle passed through sclerotica.

14th. Vision does not improve.

May 16th. Vision much improved since last report.

Aug. 1st. Left pupil perfectly clear, and vision of this eye good; lower-outer part of right pupil clear; its upper-inner part occupied by an opaque capsular shred. With a 2½-inch convex glass, reads a school Testament with left eye. With right eye sees a little when he looks dextrad.

In the third stage of glaucoma, the hope of doing any good by an operation is gone: and from the dissolved state of the vitreous humour and varicose condition of the vessels, there is much risk in attempting such a thing.

I have already hinted that the different elements of glaucoma do not present themselves in the same invariable order. The retinal, or amaurotic element, for example, is often the first to attract notice. Weller thinks that it is always the first in the series of morbid changes, for he says, "Primum hujus morbi symptoma visûs defectio est, pupillæ color subviridis multo serius demum animadvertitur."[24] But I believe it were more conformable to the fact to say, that in such instances as Weller has taken for the ground of this remark, an amaurotic eye has become glaucomatous, than that the group of symptoms which constitute glaucoma has originated in the retina.

Amaurosis so generally attends the advanced stages of glaucoma, that it has been presumed always, and in all stages, to do so. Mr. Wardrop, as we have already seen, even goes the length of calling glaucoma a species of amaurosis. Shaw's case shows the erroneousness of this view; his left eye was affected with distinct glaucoma, advanced into the second stage, yet the retina proved perfectly sensible.

It is necessary to be aware, that a glaucomatous eye is always very susceptible of suffering inflammation and disorganization, even from the slightest operation which may be practised upon it. Arthritic inflammation, with severe and long-continued pain, closure of the pupil, and total insensibility of the retina, is exceedingly apt to be the result of displacing a glaucomatous lens; while the operation of extraction exposes the eye almost as much to the danger of complete suppuration. Hence the propriety of having recourse rather to the operation of comminuting the centre of the anterior capsule by means of a fine needle passed through the sclerotica or cornea, and afterwards repeating a cautious division of the lens every six weeks, till it is entirely absorbed. A cataractous eye is generally perfectly healthy, except that the lens, and especially its surface, has become opaque, but in every texture of a glaucomatous eye, there is a lurking tendency to disease against which we cannot be too much on our guard.

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[1] Aphorismorum, Sec. iii. 31.

[2] "*Αἱ δὲ κόραι γλαυκούμεναι, ἢ ἀργυροειδέες γινόμεναι, ἤ κυάνεαι, οὐδὲν χρηστόν. Τούτων δὲ ὀλίγαι ἀμείνους, ὁκόσαι ἤ σμικρότεραι φαίνονται, ἤ ἐυρύτεραι, ἤ γωνίας ἔχουσαι, ἔιτ’ ἐκ προφασίων τοιαύται γινοίατο, ἐιτ’ αὐτόμαται.*" —Prædictionum, Lib. ii. 28.

[3] De Re Medica; Lib. vi. cap. iii. sec. ii.

[4] "Sub his gutta humoris est, ovi albo similis, a quâ videndi facultas proficiscitur: *κρυσταλλοειδὴς* a Græcis nominatur."—Ib., Lib. vii. pars ii. cap. i. sec. ii.

[5] Pliny mentions both *glaucomata* and *suffusiones*; but makes no accurate distinction between them.—Historia Naturalis, Lib. xxviii. § 29; xxix. § 38; xxxv. § 51.

[6] "*Καὶ γὰρ καὶ ταῦτ’ εἴρηται πρόσθεν, καὶ ὡς ἀυτὸ τὸ κρυσταλλοειδὲς ὑγρὸν, τὸ πρῶτον ἐστὶν ὄργανον τῆς ὄψεως. Τεκμηριοῖ σὲ ἐναργῶς τὰ καλούμενα, πρὸς τῶν ἰατρῶν ὑποχύματα, μέσα μέν ἱστάμενα τοῦ κρυσταλλοειδοῦς ὑγροῦ καὶ τοῦ κερατοειδοῦς χιτῶνος.* * * ——— *Καὶ ὡς τὸ πάθημα, τὸ πρὸς τῶν ἰατρῶν ὀνομαζόμενον γλαύκωσις, ξηρότης μέν ἐστι, καὶ πήξις ἄμετρος τοῦ χρυσταλλοειδοῦς ὑγροῦ.*"—Galenus De Usu Partium; Lib. ix. Opera, Vol. i. p. 473; Basileæ, 1538.

[7] Quoting from Rufus, Oribasius observes, "Glaucoma et suffusionem veteres unum eundemque morbum esse existimarunt: posteriores verò glaucomata humoris glacialis, qui ex proprio colore in glaucum convertatur et mutetur, morbum esse putaverunt: suffusionem verò esse effusionem humorum inter uveam et crystalloidem tunicam concrescentium: cæterùm glaucomata omnia curationem non recipiunt; suffusiones verò recipiunt, sed non omnes." —Oribasii Synopseos, Lib. viii.; Cap. 47; Rasario interprete; Basileæ, 1557.

[8] Traité des Maladies de l'Œil, p. 223.; Troyes, 1711.

[9] Traité de la Cataracte et du Glaucoma; Paris, 1709.

[10] Heister de Cataracta, Glaucomate, et Amaurosi, p. 46; Altorfi, 1713.

[11] Dei Moti dell' Iride, pp. 15, 16; Lucca, 1765.

[12] Commentatio exhibens Oculi Humani Anatomiam et Pathologiam, p. 40; Norimbergæ, 1810.

[13] Doctrina de Morbis Oculorum, § 460; Pesthini, 1831.

[14] Essays on the Morbid Anatomy of the Human Eye; Vol. ii. p. 127; London, 1818.

[15] Lehre von den Augenkrankheiten, p. 565; Berlin, 1836.

[16] Lehre von den Augenkrankheiten, p. 326; Wien, 1834.

[17] Op. cit.; Vol. ii. p. 264; London, 1818.

[18] Ammon's Zeitschrift für die Ophthalmologie; Vol. v. p. 62; Heidelberg, 1835.

[19] The infusion of *lignum nephriticum*, if held between the light and the eye, appears of a golden or reddish colour; but if held from the light, so that the eye is between the light and the phial, it appears of a blue colour. (Boyle's Experiments and Considerations touching Colours, pp. 199, 216; London, 1670). The purpurate of ammonia, viewed by transmitted light, is of a deep red colour; while, by reflected light, the two broadest opposite faces of the crystals of that salt appear of a brilliant green. (Philosophical Transactions for 1818, p. 423.) If a current of hydro-sulphuric acid

gas is transmitted through ox's blood, whipped and deprived of its fibrine, a large quantity of the gas is absorbed, and the blood becomes of a dingy olive green colour by reflection, of a dingy muddy red by transmission. A solution of bile in alcohol presents also these two kinds of colour. (Tiedemann et Gmelin, Recherches sur la Digestion, p. xix ; Paris, 1827.) A solution of sulphate of quina in tartaric acid, largely diluted, although perfectly transparent and colourless when held between the eye and the light or a white object, exhibits in certain aspects, and under certain incidences of the light, an extremely vivid and beautiful celestial blue colour. (Herschel, Philosophical Magazine, March, 1845, p. 256.)

The last-mentioned phenomenon is an example of what is termed by Professor Stokes, (Philosophical Transactions for 1852, p. 463.) *fluorescence*, and it may turn out on further examination that the diplochromatic appearance of the glaucomatous lens may belong to the same category. *Diplochromatism* may be used to signify such change of colour as we observe in the glaucomatous lens, and in various other substances, according as they are viewed by reflected or by transmitted light; the terms *dichromatism* and *dicroism* being already appropriated to other optical phenomena.

[20] Ammon's Zeitschrift für die Ophthalmologie ; Vol. i. p. 310; Dresden, 1831.

[21] Handbuch der Augenheilkunde; Vol. ii. p. 726 ; Wien, 1830.

[22] Ueber das Glaukom, pp. 92,150; Leipzig, 1844.

[23] Handbuch der praktischen Augenheilkunde; Vol. v. p. 146 ; Leipzig, 1825.

[24] Icones Ophthalmologicæ, p. 22; Lipsiæ, 1824.

SECTION II. — CAT'S EYE.

There can be little doubt, that under the appellation of *cat's eye*, several diseased states have been confounded, differing entirely in their nature and seat, and agreeing only in an opalescent appearance of the pupil, or of the bottom of the eye, these parts reflecting the light in various colours, or at least with various degrees of intensity, according to the direction in which the eye is turned. This appearance Beer[1] compared to the reflection from the tapetum of the eye of a cat.

1. What Beer calls amaurotic cat's eye, occurring in children, after injuries of the eye, is nothing else than what has been already described (page 707) as a non-malignant deposition occupying the place of the vitreous humour. This occurs in adults as well as children, and ought, from the occasion which gives rise to it, to be called traumatic cat's eye.

Case 859.—In a man who came under my care, a wound of the cornea by a chip of iron caused considerable inflammation of the external tunics, great muddiness of the anterior chamber from effused lymph, and a gold-green colour of the iris. As the anterior chamber cleared, lymph was seen lying on the capsule; this, under the usual treatment, was absorbed, and the lens was now seen transparent; but behind it, an opaque concave appearance of a yellowish-green colour was observed, as if from lymph covering the retina. The eye, in this state, retained a mere perception of light and shade.

2. The affection in old people, which Beer includes in the description already referred to, and which presents a peculiar reflection, often of a silvery or nacreous appearance, from the bottom of the eye, is different.[2] I have seen this sort of cat's eye both in eyes which retained vision, and in amaurotic eyes. The reflection generally came from one side of the eye, and seemed to be as deep as the retina. The patients, in all the cases I have seen, were far advanced in life. The cause of the reflection is unknown, but it cannot be a mere deficiency of pigmentum nigrum.

3. There is another state of the eye, in which the reflected and

varying light seems to come from the front of the crystalline capsule, and presents a close resemblance to the reflection from a piece of opal, a mineral popularly called cat's eye. In the cases in question, when we view the eye directly in front, the appearance is merely that of a brownish opacity; but whenever the patient looks upwards, the opalescence becomes very striking, presenting almost a glittering or silvery reflection.

The nature of this disease, which is plainly quite different from those already noticed, has never been determined by dissection.

In one case, in which both eyes were affected, and a mere perception of light and shade was retained, I ventured, at the patient's request, to open one of the corneæ, and introduced a cataract needle through the pupil. I felt nothing like the resistance of the lens, a profuse discharge of aqueous fluid took place, the cornea healed, and the opalescent appearance continued almost exactly the same as before the operation.

In another instance, in which this kind of cat's eye was very distinct, the patient read with facility by the help of glasses, and presented no signs of amaurosis.

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[1] Lehre von den Augenkrankheiten; Vol. ii. p. 495; Wien, 1817.

[2] This variety of cat's-eye is represented by Ammon, in his Darstellungen; Theil i. Taf. 15. Fig. 10, 11.

CHAPTER XXIV.

VARIOUS STATES OF ABNORMAL VISION.

SECTION I.—MYOPIA.

Syn.—Myopia, from *μύω, I shut*, and *ὤψ, the eye*; the *μύωψ*, or *short-sighted person*, being in the habit of half-shutting his eyes when he endeavours to see distant objects. Short-sightedness. Near-sightedness. Vue basse, *Fr.* Over-refraction.

There is a certain distance from the eye, called *the point of distinct vision*, at which objects are perceived better than at any other distance. This point, however, varies in different individuals, or even in the two eyes of the same person. It averages from about fifteen to twenty inches. The shortest distance at which objects can be seen with any ordinary degree of distinctness by common eyes, is about seven or eight inches. But some eyes can discern no object distinctly unless it be brought nearer than the ordinary distance for distinct vision, or even within seven inches, while others require the object to be removed farther than the average point of distinct vision. Eyes affected in the former way, are said to be *myopic*; in the latter, *presbyopic*. In both cases, they may be said to be out of focus.

These two classes of defective eyes are generally regarded as dependent upon some peculiarity in the transparent media of the organ. In the myopic eye it is supposed that the rays of light must either be refracted too much, so that they converge into foci anteriorly to the retina, or that the axis of the eye must be longer than natural, so that the retina is too far back, and does not receive that perfect impression which is necessary for distinct vision. The reverse of this is supposed to have place in the presbyopic eye. Either its axis is too short, or its refractive powers too feeble, so that the rays of light proceeding from objects and entering the eye, tend to collect into foci, not upon the retina as they ought to do, but behind it. It is only, however, by that degree of refraction, or with that form of the eye, which permits the rays of light proceeding from the luminous points of objects placed at an ordinary distance from the observer, to be brought into corresponding or nearly corresponding focal points upon the retina, that perfect vision can be produced. Falling either before the retina, or tending to fall behind it, the image will necessarily be diluted, and the impression obtuse. To remedy these defects, the person affected with myopia brings the object within that distance which will insure the image being thrown so far back as to fall upon the retina, while the presbyopic person, by removing the object to a certain distance from his eye, brings the image forwards to the retina.

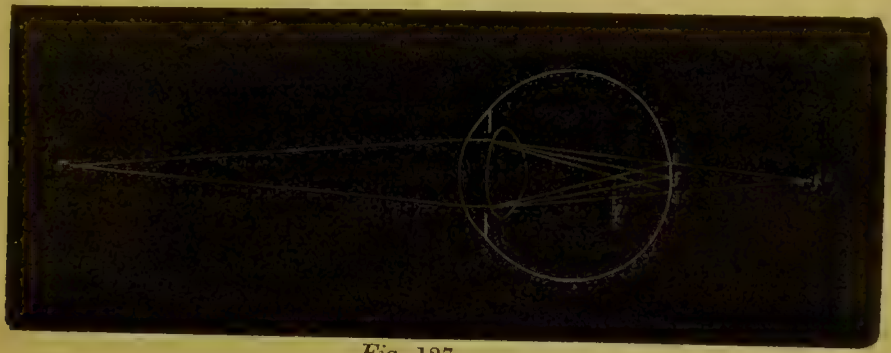

Fig. 127.

Let *r* in the annexed diagram (*Fig.* 127.) represent a radiant point: if the rays proceeding from it fall upon a normal eye, their focus will be at *f* on the retina; if upon a myopic eye, their focus will be at *f′* in front of the retina; if on a presbyopic eye, their focus will be at *f″* behind the retina; and in these two cases, the image of *r* on the retina will occupy the space *ss′*, so as to be greatly diluted.

Symptoms. — 1. *Objective symptoms.* — The eyes of the short-sighted are frequently prominent, and the cornea preternaturally convex; there is an approach to the state of hydrophthalmia, the anterior chamber being more than commonly deep; the pupil is generally large and not very lively, the eyeball firm, the eyelids often tender.

2. *Subjective symptoms.* — As the myopic eye has its point of distinct vision as well as the perfect eye, those affected with the greatest degree of near-sightedness bring every object which they wish to see clearly, to the distance of two or three inches, or even as close as one inch from the eye, while other myopic persons are able to enjoy as good vision, although the object is at six or nine inches' distance. The eye which perceives nothing distinctly beyond ten inches, may be considered myopic. The imperfection, then, cannot be concealed, if the individual affected with it attempts to read, or to examine any small object minutely. If we direct his attention to objects at any considerable distance, it is evident that they either

make no impression on his retina, or one which is exceedingly indefinite and obscure. He cannot distinguish the countenances of the performers on the stage, nor the subject of pictures placed a few feet above his head; he cannot read the inscriptions on doors and houses, nor recognise persons across the street; if he go into a large room, in which there are many persons, he cannot readily distinguish those he knows.

It is remarked of those who are short-sighted that they do not look at the person with whom they converse, because they cannot see the motion of his eyes and features, and therefore they are attentive to his words only; that in reading, they hold the book obliquely towards their eyes, this helping them to see it distinctly, perhaps by allowing the light to illuminate it better; that they see more distinctly and somewhat farther off by a strong light than a weak one, on account of the contraction of the pupil which is thereby produced, and which serves to exclude all but the more direct rays of light, and consequently to lessen the apparent confusion; that on the same principle, when they endeavour to see any distant object distinctly, they almost close their eyelids, and that through a pin-hole in a card, objects appear to them clearer and better defined than with the naked eye.

Short-sighted persons write a small cramp hand, and prefer to read a small type, the enlargement of the visual angles by the proximity of the object, enabling them to do so.

In an obscure light they commonly see better than those whose sight is good, on account of the largeness of the pupil. The short-sighted person sees near objects without effort; whereas those who have ordinary sight, contract the eyelids and the pupil, to obtain the same effect, and consequently receive less light in a medium degree of illumination, and when the eye is directed to near objects, than do those who are myopic.

Short-sighted persons generally attribute to distant objects a greater magnitude than do those who have a good common sight. The reason is that, while distinct images are formed in the perfect eye only at the intersection of the rays of light issuing from the object, the short-sighted eye receives on the retina all those rays beyond their intersection, and consequently at a point where they are more extended.

The sight of one who is myopic is much improved by his looking through a small hole, such as that made by a pin in a card. A myopic eye sees near objects distinctly, because the foci of the refracted rays are at the retina. Distant objects are seen indistinctly, because the retina being behind the foci, the image of each point is expanded on the retina, in the form of a circular halo; and as the images of adjacent points overlap, indistinct vision is a necessary consequence. The area of the halo formed by each point depends on the diameter of the pupil; being greater, the greater that diameter. Hence it obviously follows that by diminishing the aperture through which the light is admitted, the halo will be less extensive, and the images, of the adjacent points more distinct, or, in other words, vision will be clearer.[1]

If a short-sighted person looks at a candle placed a yard or two off, it appears dim and enlarged, and seems doubled, tripled or quadrupled. This multiplication by the myopic eye in viewing distant objects, must arise from each surface of the dioptric media forming an image in succession. Similar multiplied images are seen by ordinary eyes, when the eye, in viewing a distant object, is by a voluntary effort adapted for vision at a short distance. Thus, when a person with ordinary sight adapts his eyes for vision at 10 inches, and looks at a candle at the distance of six feet, the appearance presented is that of several images partially overlapping each other. This seems to indicate that in the adjusting of the eye to distances a change takes place in the relative curvatures of the dioptric media. On the theory of there being no accommodating power in the eye, only one image, ill-defined and slightly enlarged, would be expected in such a case.

It is a question which naturally occurs to one who first turns his attention to the nature of myopia, whether this disease consists merely in over-refraction, or involves also a deficiency in the accommodating power of the eye to different distances. Dr. Smith is of opinion, that the power of varying the quantity of refraction is still retained by the myopic eye. "If short-sighted persons," says he, "can read a small print distinctly at two different distances, whereof the larger is but double the lesser, which I believe most of them can do; it follows that as great alterations of figures are made in their eyes as must be made in perfect eyes, in order to see distinctly at all intermediate distances between infinity and the larger of those two. And this is the reason that a short-sighted person can see distinctly at all distances with one single concave of a proper figure, which otherwise must have been differently figured for different distances. It follows, then, that the cause of short-sightedness is not a want of power to vary the figure of the eye and the quantity of refractions, but that this whole quantity is always too great for the distance of the retina from the cornea."[2]

It is rarely the case that the two eyes, even of the same person, correspond in refractive power. The left, partaking perhaps in the tendency to weakness and disease, which so frequently attaches itself to the left side of the body, is often found to be somewhat short-sighted. Few are aware of the disparity which often exists between their eyes, until some accidental circumstance leads them to make a comparative trial of the two; and it is by no means uncommon to meet with individuals who, on making the experiment, have discovered that one eye was greatly defective, or even entirely blind. Mr. Wardrop remarks[3], that it will generally be found, that not only the right is more perfect than the left eye, but that when a person is apparently looking at an object with both eyes, generally only one of them, and that the right one, is actually directed to the object. But this will depend entirely on whether the right or the left is the better of the two. To ascertain the fact, let a spot, at the distance of a few yards from the observer, be covered with the point of one of his fingers, while he endeavours to look at it with both eyes. If the short-sighted eye, which we may suppose to be the left, be now closed, the point of the finger will continue to appear to cover the spot, and to preserve the same relative situation to it as when both eyes were open; but if the right eye be closed and the left opened, then the relative situation of the point of the finger and spot will appear altered, the spot being uncovered; proving that, in directing the finger to cover the spot, the right eye alone had been employed. Mr. Wardrop has met with myopia more frequently in the left eye than the right; Mr. Ware, on the other hand, observes that most of the near-sighted persons with whom he has conversed, had the right more affected than the left, and he thinks it not improbable that the difference had arisen from the habit of using a single concave hand-glass, which, being commonly applied to the right eye, contributes to render it more short-sighted than the other.[4]

Efficient causes. — Myopia has been attributed to a variety of efficient causes, several of which may coexist.

1. *Too great convexity of the cornea.* — As it is before the rays of light reach the crystalline lens that they undergo their greatest refraction, it is evident that a cornea, abnormally convex, will produce a convergence so rapid that the foci will fall considerably short of the retina. While it is undeniable, however, that in aggravated instances of myopia, the cornea, natural in diameter, may be observed to project considerably above its average altitude, it is also certain that this conformation is by no means a constant, nor even a very frequent attendant on this disease. When it does occur, it is generally accompanied by an evident superabundance of aqueous humour, and occasionally by a degree of pressure backwards on the iris, so that this membrane, instead of being plane, becomes concave anteriorly.

2. *Too great thickness of the cornea* will undoubtedly tend to bring the rays of light to a focus sooner than they ought to be brought; but it is not at all likely that the cornea is ever of such extraordinary thickness in the adult eye, as of itself to be the cause of myopia. At birth, indeed, the cornea is very thick in proportion to the size of the eye; and to this Petit has ascribed, in part, the indistinctness of vision in very young children.[5]

3. *Too great convexity of the crystalline lens* will assuredly produce short-sightedness, whether the over-convexity be on one only, or on both sides of that body. Such conformation has been regarded as probably one of the most frequent causes of myopia; and notwithstanding the testimony of Percy and Reveillé-Parise [6], that on examining the lenses taken from the eyes of a number of persons who during life had been short-sighted, they were unable to detect any excessive convexity, we must still admit not merely the possibility of this cause, but the likelihood of its frequent existence.

I have already mentioned the disparity of the eyes of most individuals. I cannot but think that this often depends on different degrees of refractive power in the crystalline lenses, and the opinion is corroborated by what is stated by Meckel, that the crystalline lenses of the two eyes of the same person have sometimes a very different form.[7]

4. *Preternatural density of any or all of the transparent media of*

the eye is also a cause, which will infallibly produce myopia, and which is not unlikely sometimes to occur. I have generally observed that myopic eyes are considerably firmer to the touch than natural, even at an early period of life.

Those who suppose the adjustment of the eye to near objects to be accomplished by pressure on the lens, by which means its surfaces are made more convex, incline to think that this pressure, frequently exercised in consequence of intense and continued application to near objects, renders the lens denser than ordinary towards its centre, and that the result is myopia. This is the opinion of Mr. Smith[8], who believes the capsule to be muscular; a notion which is no doubt incorrect. The same result, however, might follow, were the change of figure in the lens affected, as Professor Forbes thinks it probably may be, by the action of the external muscles communicated to the entire eyeball, and propagated by hydrostatic pressure through the humours.[9]

5. *Abnormal elongation of the eyeball,* so that the distance between the cornea and retina is increased, will necessarily occasion myopia, and has even been regarded by some as the only admissible cause of the disease. Such conformation of the eye has been supposed to be sometimes congenital, and in other cases to be acquired from frequent exercise of the sight upon minute objects. When congenital, it has been ascribed to unnatural shortness of the recti; when acquired, to abnormal contraction of these muscles, and of the obliqui.

6. *Over-activity of the power inherent in the eye, of accommodating itself to the vision of near objects,* may be regarded as a probable cause of myopia. Of the existence of this faculty in the eye there can be no doubt, but by what particular means the adjustment is accomplished, is a question upon which a great diversity of opinion prevails.[10] According to the calculation of Olbers, if the distance of the crystalline lens from the retina could be varied to the extent of a line, we should be enabled to see objects with equal distinctness from a distance of four inches to the utmost extent of human vision. The same effect would result from a change of place in the lens to the amount of half a line only, provided the radius of the cornea admitted of being varied to about two-fifths of a line. If we suppose, then, that there is an over-activity in the organs by which these or other adjusting changes in the dioptric media of the eye are produced, an over-activity excited by two frequent application of the eye to near objects, and degenerating into a habit, we assign as a possible cause of myopia, and one which is rendered probable by the success which sometimes attends methodical and continued attempts to correct and overcome the habit.[11]

7. *The large pupil,* which almost always accompanies myopia, has been generally set down amongst the causes of the disease, whereas it is more probably an effect. When the sight is perfect, and still more when it is presbyopic, the pupil will have frequent occasion to contract, in aiding the person to see near objects more distinctly, and thus an habitual degree of myopsis may be produced; but in those who are short-sighted this will not happen, for to them near objects appear distinct, and therefore not having occasion to contract the

pupil for seeing such objects more distinctly, this aperture probably maintains an habitual state of dilatation.

By contracting the pencils of light which are allowed to reach the retina, as in looking though a pinhole, the vision of the myopic eye for distant objects is rendered more distinct, an effect equivalent to an elongation of its focus; and the same result will be produced by anything causing contraction of the pupil of the myopic eye, such as dropping wine of opium on the eye, or rubbing the brow with concentrated tincture of ginger or pepper, a fact taken advantage of by impostors in their pretensions to cure myopia.

Subjects.—1. *Age.* Young people seldom discover that they are remarkably near-sighted, until about the age of puberty, or when they begin to use their eyes in earnest. If it occurs rather suddenly, myopia is apt to be mistaken for some more serious affection.

Case 860.—A young lady, aged 16, became suddenly short-sighted, after having been engaged in flower-painting and worsted work, at a boarding-school in Edinburgh. The effort to see at the usual distance, and even to read, caused pain in the eyes. The pupils presented the sluggishness which often attends myopia. A physician of eminence was consulted, and pronounced the disease to be amaurosis. He had the patient leeched, gave her mercury, and advised a vomit and blisters. When the patient was brought to me, I found she saw perfectly through a double concave glass of 48 inches' focus, and learned that several of her near relations laboured under myopia.

Many persons reach the age of 30 or 40 years, who have no notion that they are near-sighted, until they happen accidentally to look through the concave glasses of some other individual, when they are surprised and delighted to find that they perceive remote objects with a clearness and sharpness of outline, to which they had formerly been altogether strangers. They may have suspected that they did not see across the street or at the theatre, quite so plainly as other people; but as they could read a small print as well as any body, they had no idea that they were the subjects of any defect in their eyes, or that they could improve their vision by any kind of glass.

Although near-sightedness is in general gradual in its progress, manifesting itself about the period of puberty, and increasing from that period up to 20 or 25 years of age, yet instances occasionally occur of its existence even in children, or of its suddenly affecting the eye of a grown-up person who had previously seen distinctly at the ordinary distance.[12] When children, about the period of being sent to school, are supposed to be myopic, we should carefully examine the appearances presented through the pupil, for very often a central cataract (see p. 836) will be found to exist under such circumstances; while the sudden accession of shortness of sight in adults who had previously seen well, should lead us to suspect conical cornea, dropsy of the aqueous humour, or even some affection of the retina or of the brain.

It is a vulgar error, that near-sighted eyes are by age rendered fitter for perceiving distant objects than they were in youth. This opinion appears to have been built on the following false analogy; viz. that if those who possess ordinary vision when young, become, from the flatness of the cornea or other changes in the structure of the eye, far-sighted as they approach to old age, which is a well established fact, then, the short-sighted must, from similar changes, become better fitted to see distant objects. Short-sightedness tends generally to increase rather than to diminish, as age advances; and should it come to be combined with a glaucomatous state of the lens, the person is obliged to bring any subject, which he wishes to see distinctly, within a very short distance of the eye.

2. *Rank and occupation.* Myopia is much more common in the higher than in the lower ranks of life, and among those who occupy themselves with the close examination of minute objects than in those who scarcely ever attempt to read, write, or apply themselves to any similar pursuit. Mr. Ware remarks, that among persons in the inferior stations of society, artificial means are rarely resorted to for correcting slight defects of this nature; and that there is even reason to believe that, in such people, near-sightedness is not unfrequently overcome by the increased exertions that are made by the eye to distinguish distant objects. When persons in the higher ranks, on the other hand, discover that their discernment of distant objects is less quick or correct than that of others, though the difference may be very slight, influenced perhaps by fashion more than by necessity, they immediately have recourse to a concave glass; the natural consequence of which is, that their myopia in a short time becomes so confirmed that the recovery of distant vision is difficult, if not impossible.

With regard to the proportion of near-sighted persons in the different ranks of society, Mr. Ware endeavoured to obtain satisfactory information, by making inquiry in those places where a large number of individuals of nearly the same station are associated together. He inquired, for instance, of the surgeons of the three regiments of foot-guards, consisting of nearly 10,000 men; and he was informed that near-sightedness was almost unknown amongst them, not six individuals having been discharged, nor six recruits rejected, on account of this imperfection, in the space of nearly 20 years. At the Military School at Chelsea, where there were 1300 children, the complaint of near-sightedness had never been made among them, until Mr. Ware mentioned it, and then only three were found who experienced the least inconvenience from it. He pursued his inquiries at several of the colleges in Oxford and Cambridge, and found near-sightedness very prevalent in these institutions. In one college in Oxford, where the society consisted of 127 members, 32 either wore spectacles or used hand-glasses. It is not improbable, that some of these were induced to do so, solely because the practice was fashionable; but Mr. Ware believes the number of such to have been inconsiderable, compared with that of those whose sight received some small assistance from glasses, although this assistance could have been dispensed with without inconvenience, if the practice had not been introduced.[13]

Predisposing and exciting causes. — 1. Rarely congenital, but often connected with a hereditary tendency, myopia owns, as a chief predisposing or exciting cause, the using of the eyes too much in early youth, on small and near objects. Henke refers short-sightedness to the narrow circle of vision rendered customary in confined nurseries.[14] 2. The use of concave glasses so notoriously produces or increases myopia, that in France they were often employed for the purpose of thereby rendering the wearers unfit for military service, and thus enabling them to escape the conscription. The plan seems to have been to commence with pretty deep concaves, and gradually employ deeper and deeper, till the sight became so short that distant objects could not be discerned.[15]

General Treatment.—It is but rarely the case that the medical practitioner has an opportunity of advising those in whom myopia is not yet confirmed, to that course of treatment which might remove the incipient symptoms of this very serious imperfection of sight. If it be correct that this disease, in by far the greater number of instances, is induced by too much exercise of the eyes upon minute objects, as in reading, writing, sewing, miniature painting, engraving, and the like, the cure would probably be found in abstaining entirely for a time from such occupations, refraining also from the use of concave glasses, and employing the eyes chiefly upon large and distant objects. It is probable, that the plan of gradually removing the book from the eye till it can be read at the ordinary distance, reading through convex glasses, and other attempts of a similar sort, will prove of little use, in comparison of the good effects to be derived from frequent exercise out of doors, walking and riding into the country, and travelling through new and interesting scenes.

If, instead of such a plan of conduct, recourse be had to the employment of concave glasses, and frequent and long-continued observation of near objects be persisted in, the disease becomes not only confirmed, but sometimes greatly aggravated.

"Children," says Sir Charles Blagden, "born with eyes which are capable of adjusting themselves to the most distant objects, gradually lose that power soon after they begin to read and write; those who are most addicted to study become near-sighted more rapidly; and, if no means are used to counteract the habit, their eyes at length lose irrecoverably this faculty of being brought to the adjustment for parallel rays. Of this I am myself an example. . . . . .

"When I first learned to read, at the usual age of four or five years, I could see most distinctly, across a wide church, the contents of a table on which the Lord's Prayer and the Belief were painted in suitably large letters. In a few years, that is, about the ninth or tenth of my age, being much addicted to books, I could no longer read what was painted on this table; but the degree of near-sightedness was then so small, that I found a watch-glass, though as a meniscus it made the rays diverge very little, sufficient to enable me to read the table as before. In a year or two more, the watch-glass would no longer serve my purpose; but being dissuaded from the use of a common concave glass, as likely to injure my sight, I suffered the inconvenience of a small degree of myopy, till I was more than thirty years of age. That inconvenience, however, gradually though slowly increasing all the time, at length became so grievous, that, at two or three and thirty, I determined to try a concave glass; and then found that the numbers two and three were to me in the relation so well described by Mr. Ware; that is, I could see distant objects tolerably well with the former number, but still more accurately with the latter. After contenting myself a little time with No. 2, I laid it wholly aside for No. 3; and, in the course of a few more years, came to No. 5, at which point my eye has now been stationary between fifteen and twenty years. An earlier use of concave glasses would probably have made me more near-sighted, or would have brought on my present degree of myopy at an earlier period of life. If my friends had persuaded me to read and write with the book or paper always as far from my eyes as I could see, or if I had occasionally intermitted study, and taken to field sports or any employment which would have obliged me to look much at distant objects, it is very probable that I might not have been near-sighted at all.[16]

Methodical exercise of the eyes.—As myopia may, to a certain extent, be regarded as a habit, arising from too frequent, and at last continued adjustment to near objects, and as any one by too much exercise of the sight on such objects can make himself short-sighted, it is reasonable to suppose that much may be done in correcting this failing, by an opposite exercise of the sight, gone about in a methodical and persevering manner. For this purpose, Professor Berthold recommends the use of a corrective desk, or *myopodiorthoticon*, upon which all the reading and writing of the patient should be carried on. From the back of the desk two screws rise vertically, one at either side. These screws pass through and support a cross-bar, which is moved upwards by means of two nuts situated below it, and moved downwards or retained in position by two other nuts situated above it. Through the middle of the cross-bar a graduated rest passes for the support of the forehead, which rest, being moveable to and fro horizontally, is also held in position by a screw. By the motion of the cross-bar on the vertical screws, and of the rest in the cross-bar, the apparatus is so regulated, that the head, in relation to the book to be read or paper to be written on, is placed in the position best adapted to the power of sight. Parallel to the vertical screws, two scales, graduated like the horizontal rest, to tenths of an inch, pass upwards through the cross-bar. By these scales, the apparatus is adjusted to the differently sized print of the books to be read, and to the gradual extension of vision as the cure proceeds.

In employing the apparatus, it must be so regulated, that the person using it can read large print with ease, whilst leaning with the upper part of the root of the nose against the horizontal rest. Moving the cross-bar upwards, by turning the nuts on the vertical screws, the distance between the free extremity of the rest, on which the forehead leans, and the book, or the distance of distinct vision, is to be increased every second, third, or fourth day, from $\frac{1}{20}$ to $\frac{1}{10}$ inch, measured on the scales, but never to a point where the print cannot be read with facility. A rapid increase of distance must be especially avoided, as the power of adjusting the eye to remote objects is but slowly attained. For reading with the apparatus, a book must be chosen of a clear and large print, and, if possible, with the same-sized type throughout. As the same print should be read as long as possible, a work consisting of a large number of volumes is preferable. For writing, the distance of the eyes from the paper may be somewhat more ample than for reading, if the patient observes the rule, to write a large hand.

The principle of Professor Berthold's apparatus is simple and correct, the application of it requiring only patience on the part of the person employing it, and a devotedness to the object to be gained. The duration of the treatment with the apparatus will be proportioned to the degree of the myopia, and in early life a more rapid cure may be expected than in mature age. The chief condition of success, is the slow but steadily progressive increase of the distance at which vision is exercised, especially in the beginning of the treatment.[17]

Concave glasses.—If convex spectacles were not invented by Roger Bacon, they were well known about the time of his death, in 1294; although not long before that period. It is probable, that the use of concave glasses, to help the vision of those who are short-sighted, followed soon after that of convex ones, though no trace of their introduction is mentioned in the history of optical science. Maurolicus, in his treatise *De Lumine et Umbra*, written in 1554, considers the crystalline as the principal instrument of vision, and as transmitting to the optic nerve the images of objects; and he explains why some persons are long-sighted and others short-sighted, according to the less or greater convexity of the surfaces of the crystalline, showing that in the former case the rays have not been converged to a focus when they reach the retina, while in the latter they have been converged before they reach it. He explains, also, how the convergency may be hastened in the long-sighted eye by the use of a convex glass, and delayed in the short-sighted by a concave one. These observations of Maurolicus were not known to Kepler, when it was proposed to him, as a question by his patron, Dietrichstein, in what manner spectacles assisted sight. The first answer he gave, as he tells us in his *Ad Vitellionem Paralipomena*, published in 1604, was, that convex glasses were of use, by making objects appear larger. But his patron observed, that if objects were by them rendered more distinct, because larger, no person would be benefited by concave glasses, since these diminished objects. The striking resemblance between experiments with the camera obscura and the manner in which vision is performed in the eye, had been pointed out by Baptista Porta, in his *Magia Naturalis*, published in 1560, where he compares the pupil to the hole in the window-shutter, but falls into the mistake of assigning to the crystalline the office of receiving the images, like the wall or screen in the camera obscura. Kepler, in his work above referred to, was the first to show that the office of receiving the images of external objects is performed by the retina. He now gave a clear account of the effects of lenses, whether within or without the eye, in making the rays of a pencil of light converge or diverge; and explained, that convex glasses assist the sight of presbyopic persons, by so altering the directions of rays diverging from a near object, that they fall upon the eye, as if they had proceeded from a more remote one, and that concave glasses benefit the myopic, by producing a contrary effect upon rays which diverge from a distant object, making them fall upon the eye as if they proceeded from a near one.

The glasses commonly employed for the assistance of myopic eyes are double-concaves, of equal concavity on each side. Occasionally, however, the two sides are made of unequal depth. A plano-concave or concavo-convex glass might answer. Dr. Wollaston introduced a kind of spectacles, which, from their affording an opportunity of looking round at various objects without moving the head, he called *periscopic*. They owe this property to always having the surface next the eye *concave*, whether the glasses are intended for short or long-sighted persons, the convex outer surface being a segment of a larger sphere than the concave inner surface for short-sighted persons, and of a smaller one for long-sighted persons. A wider field is gained in proportion as the second surface approaches to the curvature of the cornea; at the expense, however, of distinctness of vision, as such lenses increase the aberration both of colour and of figure.[18]

"When we look at any object," says the author of the article

"Optics" in the Edinburgh Encyclopædia, "so as to see it distinctly, we have distinct vision only over the small portion of it to which the axis of the eye is directed, all the rest of it being seen in a confused manner by oblique or indirect pencils. In reading, therefore, or in the examination of minute objects, we cannot see any advantage in the use of periscopic spectacles; but, on the other hand, when used out of doors, either in viewing a landscape, where the oblique portion of the image forms part of the picture, or in giving us warning of the oblique approach of objects, they are of essential use."

Myopic persons are extremely apt to adopt the use of a single eye-glass, against which we ought to put them on their guard. Spectacles are always preferable, because by keeping both eyes in action, not only is vision rendered brighter and easier, but the labour of each eye is considerably lessened.

Double-concave glasses are numbered 1, 2, 3, &c., beginning with the longest focus, or shallowest concavity.[19] We must recommend to the near-sighted person to be content with the shallowest glass, or lowest number, which answers his purpose. If No. 1 enables him to discern distinctly the names on the corners of the streets, and gives a decided outline to objects whose distance does not exceed about forty feet, he ought not to have recourse to No. 2. Objects should appear clear through the glass which is chosen; but if it makes them less than natural, or gives them a dazzling or glaring appearance, or if the eye feels strained or fatigued after looking through it for a short time, it is too deep, and a lower number should be selected.

When a near-sighted person wishes to be fitted with concave glasses, the simplest and surest plan is to try a series of them, at an optician's shop. It may happen, however, that an individual in the country is desirous of writing to town for concave glasses, and wishes to mention the focus which will be likely to suit his eye. This may be ascertained by means of the optometer, as improved by Dr. Young; but as this instrument is not always at hand, the following rules may be adopted.

1. If the near-sighted person is desirous of assistance in seeing remote objects, *i. e.* beyond 200 or 300 yards, the focal distance of the glasses which he will require for that purpose, should be the distance at which a small object appears distinct to his naked eye. For example, if he reads this type at 12 inches' distance, 12 inches will be the focus of the concave glasses which he will require for seeing distant objects distinctly.

2. If the glasses wanted are intended for reading with, or seeing near objects, let the near-sighted person multiply the distance at which he is able to read with ease with the naked eye, say 4 inches, by the distance at which he wishes to read, say 12 inches; divide the product 48 by the difference between the two, which in this instance is 8; the quotient, 6, is the focal length in inches of the glass which is required.

It is a common error with those persons who begin to use concave glasses, to tire of those which they first employ, and have recourse to deeper ones. To these the eyes do not fail (at least for a time) to accommodate themselves; but, in the end, the patient, who thus proceeds from one degree of concavity to a greater, will find it difficult to obtain glasses sufficiently deep to afford him much assistance, or he may produce such a condition of the organs of vision, as shall render him unfit to engage in any ordinary pursuit. Near-sightedness generally continues, as has been already stated, in nearly the same degree during the greater part of life. Therefore, the same glass will continue, for many years, to afford precisely the same assistance, and ought not to be heedlessly changed for one of deeper concavity.

Dr. Kitchener tells us, that he was about fifteen years old, when he first discovered that he could not discern distant objects so distinctly as people who have common eyes usually do.

"Seeing," says he, "that I could not see what persons with common eyes frequently pointed out to me as well deserving my attention, I paid a visit to an optician and purchased a concave eye-glass No. 2. After using this some little time, I accidentally looked through a concave No. 3, and finding my sight much sharper with this than with No. 2, had my spectacles glassed with No. 3, which appeared to afford my eye as much assistance as it could receive. After using No. 3 for a few months, I chanced to look through No. 4, and again found the same increase of sharpness, &c. which I perceived before when I had been using No. 2 and first saw through No. 3, therefore concluded that I had not yet got glasses sufficiently concave, and accordingly procured No. 4; however, this soon became no more stimulus to the optic nerve than its predecessors Nos. 2 and 3 had been. I then began to think that the sight was subject to the same laws which govern the other parts of our system, i. e. an increased stimulus by repetition soon loses its power to produce an increased effect. Therefore, I refused my eye any further assistance than it received from spectacles glassed with No. 2, which I have worn for upwards of thirty-one years, and it is very nearly, if not quite, as sufficient help to me now as it was when I first employed it."[20]

The same author recommends persons who are extremely short-sighted, in order to prevent their being obliged to stoop, in writing, reading music, and the like, to wear spectacles with very shallow concaves, just enough to enable them to see the objects required in such cases, at the same distance with other persons; but for distant objects, to use a small opera-glass, which having an adjustable focus, if it magnifies only twice, will be infinitely better than any single concave, because it can be exactly adapted to the various distances.

When once a near-sighted person has experienced the pleasure of seeing remote objects, with that distinctness and comparative brilliancy which the aid of concave glasses affords, it is not easy to persuade him to renounce their use. It is advisable, that near-sighted persons should not wear spectacles constantly, but only on occasions when they more particularly require such assistance. When they have been worn for a considerable time, the person does not at first see so well on leaving them off as he did before; but this is only temporary.

It is not uncommon for myopic persons, and especially those in whom myopia is combined with nebulæ of the corneæ from corneitis, to use convex glasses for near objects. With such glasses, they bring the object nearer than they would do were they viewing it with the naked eye, and they see it magnified.

Myotomy. — The operation for strabismus having been found, in some instances, to remove the myopia by which the strabismus had been attended, has led to the proposal of dividing certain muscles of the eye, in cases where myopia exists alone.

M. Phillips, having remarked that the amelioration of myopia had taken place in cases where he had cut the superior oblique, proposes that a division of this muscle should be tried. M. Guérin, in what he calls *mechanical* or *muscular myopia*, in contradistinction to that which is *optical* or *ocular*, and which he attributes to an original shortness or to an active retraction of the recti, recommends two of the muscles, the internal and external, or the superior and inferior recti, to be divided. M. Bonnet comes to the conclusion, that myopia depends on an elongation of the globe of the eye, from its being compressed between the two oblique, which he remedies by dividing the inferior oblique. The success attending this operation in the hands of M. Bonnet, he states as very remarkable, as may be seen by consulting his *Traité des Sections Tendineuses et Musculaires.* At the same time, the circumstance of his having found the same operation available in a disease of a very different character from myopia, namely, asthenopia, which is attended, in fact, by an incapability of maintaining the eyes in a state of adjustment to near objects, must make us pause in receiving his conclusions, and lead us to suspect that the benefit ascribed to the division of the inferior oblique in myopia, if not altogether an illusion, may be attributable merely to the temporary excitement, both of the organ operated on, and of the mind of the patient, arising from an operation having been performed on the eye.

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[1] On vision through a pin-hole, see the author's Physiology of Vision, p. 153; London, 1841.

[2] Complete System of Optics; Vol. ii. p. 2; Cambridge, 1738.

[3] Morbid Anatomy of the Human Eye; Vol. ii. p. 229; London, 1818.

[4] Philosophical Transactions; Vol. ciii. p. 34; London, 1813.

[5] Mémoires de l'Académie Royale des Sciences, pour 1727, p. 346; Amsterdam, 1732.

[6] Hygiène Oculaire, par J. H. Reveillé-Parise, p. 32; Paris, 1816.

[7] Manuel d'Anatomie Générale, Descriptive et Pathologique, traduit par Jourdan et Breschet; Tome iii. p. 244; Paris, 1825.

[8] Philosophical Magazine, July, 1833, p. 12.

[9] Transactions of the Royal Society of Edinburgh; Vol. xvi. p. 6; Edinburgh, 1849.

[10] On the adjustment of the eye to distances, see the author's Physiology of Vision, Chapter xi.

[11] Berthold, London Medical Gazette, August 28, 1840, p. 867.

[12] See Henry, Memoirs of the Literary and Philosophical Society of Manchester; Vol. iii. p. 182; Warrington, 1790.

[13] Philosophical Transactions; Vol. ciii. p. 31; London, 1813.

[14] Handbuch der Kinderkrankheiten, quoted in Evanson and Maunsell on the Management and Diseases of Children, p. 62; Dublin, 1842.

[15] Duval, Traité de l'Amaurose, p. 117; Paris, 1851.

[16] Philosophical Transactions; Vol. ciii. p. 110.

[17] Berthold, Das Myopodiorthoticon, oder der Apparat, die Kurzsichtigkeit zu heilen; Göttingen, 1840: Franz, London Medical Gazette, August 28, 1840, p. 866; December 11, 1840, p. 442.

[18] Nicholson's Journal of Natural Philosophy; Vol. vii. pp. 143, 192, 242, 291, Vol. viii. p. 38; London, 1804.

[19] Concave glasses ought always to be distinguished by their focal lengths, and never by numbers; because the gradations of concavity are not always worked to a certain standard, so that what one optician calls No. 1, another rates as No. 2, and so on. Mr. Ramsden made the first number of his concave glasses equivalent to a convex of 24 inches' focus, i. e. if a convex of that focal length were united to a concave No. 1, the combination would be equivalent to a plane, and objects would appear through the two glasses neither larger nor smaller than they really are. No. 2 he made to correspond to a 21-inch convex; No. 3 to an 18; and so on.

The following are the foci in inches of a set of concave glasses which I keep by me, with which to try myopic eyes:—

No. 1	48	No. 7	9
2	36	8	7
3	24	9	5
4	18	10	4
5	14	11	3
6	12	12	2½

In Germany, what is called No. 1 is commonly of the focal length of 2½ or 3 inches, and each following number has an inch, or a certain number of lines, of additional focal length.

The focus of a concave lens may be ascertained by reflecting from its surface, upon an opaque body, the image of any very distant luminous object, such as the sun, observing when the image becomes smallest, and measuring the distance between the centre of the reflecting surface and the body upon which the image is received; double this distance is the focal length of the lens, and is equal to the radius of curvature of its surfaces, these being ground on the same tool. The two surfaces, however, are not always ground on a tool of the same radius; so that the one side is sometimes deeper than the other.

[20] Economy of the Eyes, Part i. p. 111; London, 1826.

SECTION II.—PRESBYOPIA.

Syn.—Presbyopia, from πρέσϐυς, *old*, and ὤψ, *the eye;* this being a state of vision to which advanced age is almost invariably subject. Long-sightedness. Far-sightedness. Vue longue, *Fr.* Diminished refraction.

Although this state of defective vision, the general nature of which has been explained at the beginning of the last section, occasionally occurs, like myopia, suddenly, and at any period of life, yet, in by far the greater number of instances, it is merely part of the changes, which the human system undergoes from advancing years. The refractive powers of the eye becoming too feeble, or its axis shorter than natural, the rays of light are not converged sufficiently soon to be brought to focal points upon the retina. The image, therefore, is diffused, and the perception indistinct; to remedy which, the individual moves the object of examination forwards from his eye, to a greater distance than his previous point of distinct vision, by this means counteracting the tendency of the rays of light, proceeding from the object when at the usual distance, to collect into foci, not upon the retina, but behind it. (*Fig.* 127, p. 905.)

Symptoms.—1. *Objective symptoms.* The objective symptoms, which generally attend presbyopia, are an apparent diminution in the size of the eyeball, which is also more sunk in the orbit, flatness of the cornea, shortening of the axis of the anterior chamber, and smallness of the pupil.

2. *Subjective symptoms.* It is, in general, about the age of 45 years, that we discover we see near objects less perfectly, especially by candle light, and that we are obliged at once to illuminate them more, and remove them farther from the eye, than formerly. The discovery, that the eye is thus beginning to be impaired by age, is gradually made, in consequence of the difficulty which the individual experiences in reading small print, nibbing a pen, threading a needle, and the like. On attempting to examine any small object close at hand, its outline becomes obscure, as if it were seen through a mist; very minute objects, such as the characters of a small printed book, are either not discerned at all, or they appear obscure, running into one another, or double; and if the attempt to see such objects is persevered in, the eyes soon feel fatigued, and the head begins to ache. Distant objects continue to be seen as before. The person can read a distant

inscription, or tell the hour by a church clock, when he cannot read a common printed book, or see the figures and hands of a watch, held in his hand.

As years continue to advance, the presbyopic defect generally becomes more decided, the eye appears to lose more and more the power of discerning near objects with distinctness, so that the individual, unless he has recourse to the aid of glasses, is forced to renounce all employments which require minute inspection; or, if he has begun the use of glasses, he is obliged to change them from time to time, in proportion as the refractive power of his eyes decreases. There are, however, great differences in the progress of far-sightedness in different individuals. Some eyes at 30 years of age, require the aid of convex glasses as much as others do at 50, while the sight of certain individuals continues almost as perfect at 50 as it was at 30. Young men of 20 sometimes cannot see to read or write without convex glasses of six or eight inches' focus, while persons of 80 years, and upwards, are occasionally met with, who are able to read even a small print, at the ordinary distance, without assistance. Some, after commencing the use of spectacles, are obliged every few years to change them for others of shorter focus; others change them only once or twice in the course of a prolonged old age, or continue perhaps for 40 years together to see satisfactorily with the aid of the same glasses. These and similar differences depend upon the original formation of the eyes, how they have been used, and the general health and constitution of the individual.

The few, who can see to read by candle-light quite as well after the age of 40, as they could before that age, will generally find that there is a small degree of shortness in the sight of one or both of their eyes, which is the cause of their possessing that advantage longer than persons in general do. If they try a very shallow concave glass, first to the one eye and then to the other, they will find it give a decided outline to distant objects, which perhaps they never saw so sharply defined before. It is a circumstance often overlooked, that the one eye may be presbyopic while the other is myopic. As age has advanced, the person furnishes himself with convex glasses, being perhaps obliged to do so, in order to read at eighteen or twenty inches, as are preachers, lecturers, &c. But after using them for years, he tries accidentally to read without them, and finds he can do so at six or eight inches. He throws the glasses aside, and continues to read without them; but, he can also read with them, showing that one eye at least is still presbyopic.

Instances occasionally occur of old persons, long accustomed to use convex glasses of considerable power, recovering their former sight at the advanced age of eighty or ninety years, so that they no longer require any artificial assistance even in reading. Dr. Porterfield was led to attribute this remarkable amendment to a decay of the adipose substance at the bottom of the orbit, in consequence of which, he supposes that the eye, from a want of its usual support, will be brought by the pressure of the muscles on its sides into a kind of oval figure, in which state the retina will be removed to a due distance from the flattened cornea.[1] Mr. Ware objects to this explanation, that we never see a morbid accumulation of adipose substance in the orbit produce presbyopia, but that on the contrary, myopia is sometimes induced by that cause; and thinks it more probable, that the remarkable revolution in question is occasioned by an absorption of part of the vitreous humour, in consequence of which the sides of the sclerotica are pressed inward, and the axis of the eye proportionably lengthened.[2] Mr. White Cooper regards such a change of sight as premonitory of hard cataract.[3]

Although the eye, after middle life, loses the power of distinguishing near objects with correctness, it generally retains the sight of those that are distant. To see distant objects with distinctness, therefore, glasses are in general not required by the presbyopic eye; on the contrary, parallel rays being sufficiently converged by the refractive media of the eye itself, to be brought to their respective foci on the retina, the convex glasses must be laid aside, when objects at a distance are to be examined. Instances, however, are not wanting of persons of advanced age, requiring the aid of convex glasses to enable them to see distant, as well as near, objects; the surface of their eye having become so flat, or its refraction so diminished, that it cannot converge even parallel rays to the retina without convex glasses, which is equivalent to a power of bringing convergent rays to a focus. Thus, Dr. Wells informs us, that when twenty years younger, he was able, with his left eye, to bring to a focus on the retina, pencils of rays which flowed from every distance greater than seven inches from the cornea; but by the time he reached the age of fifty-five, his eyes had altered considerably, with respect to their seeing near objects distinctly, and he had, in consequence, been obliged, not only to use convex glasses, but to change them several times for others of higher power. On carefully examining the state of his sight, previously to the repetition of some optical experiments, he found, to his great surprise, that the power of adapting his eyes to different distances was completely gone; in other words, that he was obliged to regard all objects, whether near or remote, in the same refractive state of those organs. He found that he required not only a convex glass of six inches' focus, to enable him to bring to a point on the retina rays proceeding from an object seven inches from the eye, but likewise a convex glass of thirty-six inches' focus, to enable him to bring to a point parallel rays.[4]

Causes.—There can be no doubt that deficient refraction is the proximate cause of presbyopia, and that it is intimately connected with the decline of life. It is also said that it is more apt to occur in those who have used their eyes much upon remote objects.

With regard to the efficient causes, flatness of the cornea from diminution in the quantity of the aqueous and vitreous humours is the one most frequently mentioned, this diminution being supposed to depend on the impeded manner in which the function of secretion is performed in advanced life.

Diminished density of any of the refractive media of the eye, or diminished convexity, will prove a sufficient cause of presbyopia.

So far as the crystalline lens is concerned, it is generally admitted that its density increases as age advances, which should tend to counteract any presbyopic tendency, arising from flattening of the cornea or deficiency of the aqueous or vitreous humours. At the same time, the increase of density of the lens may possibly be attended by a degree of shrinking, by which its form may be rendered less convex, and its refractive power diminished. I believe flattening of the lens, much more than of the cornea, to be the cause of presbyopia.

It appears to be the general opinion, that along with diminished refraction, there attends upon presbyopia a loss of that power of accommodation to the perception of near objects, which is possessed by the healthy eye. Whether this power depends on a change of form or of place in the crystalline lens, or on both of these, or on some change different from either, it is easily conceivable that a partial or total loss of this power would be quite analogous to the diminished activity which takes place in all the functions of the body on the approach of old age. That the cornea loses its elasticity as we advance in life, as well as that the crystalline becomes dense and unyielding, are facts well ascertained.

Prevention and Treatment.—Although it would be in vain to expect any plan of treatment to have the effect of removing, or perhaps even lessening a degree of presbyopia already produced in consequence of advanced age, it is but reasonable to suppose that by avoiding whatever over-fatigues the sight, and by following whatever tends to delay the progress of decrepitude, this defect may in a considerable measure be warded off. It is only to such influences, added to an original soundness of constitution, that we can attribute the exemption from presbyopia, which is occasionally possessed by men far advanced in life, and who have never been myopic.

The assistance which the presbyopic eye derives from a double-convex-glass, ought neither to be too soon had recourse to, nor too long delayed. Many injure their sight, by adopting the use of magnifiers suddenly, and before they have any need of them; while others, actuated perhaps by a desire of concealing their age, refrain from employing them long after the period when glasses would not merely have afforded valuable assistance, but have proved a means of saving their sight. I have seen a public lecturer, rejecting, from some silly motive, the aid of convex glasses at seventy years of age, assemble on and at the side of his desk six glaring wax candles, in order to illuminate his manuscript, and while he kept one of the candles, shorter than the rest, dancing over the paper, he yet stopped ever and anon from a difficulty in decyphering it. Such conduct is as dangerous to sight, as it is ridiculous. The presbyopic eye, if refused assistance, is necessarily strained by every attempt to perceive near objects, and suffers more in a few months by forced exertion, than it would do in as many years, if assisted by such glasses as would render vision easy and agreeable.

It would evidently be absurd to fix upon any period of life at which glasses should be first employed, or at which the presbyopic eye should be assisted by stronger magnifiers than those made choice of in the first instance; but it may be laid down as a general rule, that whenever a person of forty-five years of age, or upwards, finds that, in order to see small objects distinctly, he is obliged to carry them far from his eye; that he moves, as it were instinctively, nearer to the light, when he wishes to read or work, or holds the book or other object close to the light, in order to see with facility; that very small objects, after he has looked at them earnestly for some time, appear confused; that his eyes, after slight exertion, become so much fatigued, that he is obliged to turn them to other objects, in order to give them some relaxation; and that the sight, on awakening in the morning, is very weak, and does not recover its customary degree of force for some hours; then, he may, if he has not hitherto used convex glasses, begin to use them, or if he has already had recourse to those of a very long focus, he may change them for a pair of shorter focus, or, in other words, of greater refractive power.

A double-convex glass improves the vision of a presbyopic eye, simply by lessening the divergence of the rays of light proceeding from near objects, and thus ensuring their being brought into foci upon the retina. Presbyopic persons sometimes use what is termed a *reading glass,* which is a double-convex lens, broad enough to permit both eyes to see through it. By spectacles it is proposed only to render objects distinct at a given distance, but the reading glass is used to magnify the object.

As a meniscus will produce the same effect as a double-convex glass, in enabling the presbyopic eye to perceive near objects with distinctness, while it will allow the eye greater latitude without fatigue, Dr. Wollaston has recommended the former as a *periscopic* glass for far-sighted persons. It is liable, however, to the same objection as the concavo-convex glass recommended for the myopic eye, namely, increased aberration of colour and figure. (See p. 914.)

Similar directions must be followed in choosing convex glasses as in selecting concave ones; *viz.* that the lowest power, or longest focus, which answers the purpose, is to be chosen; and that as the concave glasses made use of by the near-sighted should not make objects appear smaller, neither should the convex glasses employed by the far-sighted make them appear larger than natural.[5] Convex spectacles should be chosen with candle light, as those which suffice in day light will not prove strong enough when used in the evening.

Persons at a distance from an optician, may determine the focal length of the convex glasses, which they will require, by means of the following rules.

1. If they have a distinct vision of objects *moderately remote,* let them multiply the distance at which they see minute objects most distinctly, say 20 inches, by the distance at which they wish to read by the aid of glasses, say 12 inches, and divide the product, 240, by the difference between the two, 8; the quotient, 30, will be the focal length of the glasses required.

2. If the distance at which the person sees most distinctly be *very great,* then the focal length of the glasses required will be equal to the distance at which he wishes to see the objects most distinctly.

Convex glasses of about 36 inches' focus are often used by ignorant people, under the name of *preservers*, before their sight has attained that degree of presbyopia, which renders the use of glasses necessary. They seem to think that *preservers* have some specific power of arresting the progress of that failure of the sight, which is the natural consequence of age.

As it is chiefly by candlelight that the presbyopic patient complains of his deficient sight, even after he has supplied himself with proper glasses, it is advisable that he should refrain, as much as possible, from employing himself at night in occupations, which require intense use of the organs of vision. The moment that the eyes begin to feel hot and fatigued, while the individual is occupied in reading, writing, or the like, especially by candle-light, he should take the hint, and allow them a period of repose.

A loss of the power to adjust the eyes to the vision of near objects, which is equivalent to presbyopia, sometimes suddenly occurs in subjects much under the age of 40, or even in children. I have seen this affection, in children, follow influenza in some cases, and in others inflammation of the tonsils with considerable febrile excitement. The patients could not read at all at the usual distance, but held the book 18 inches or more from the eyes, and saw better with convex glasses. In some instances, there was a dimness even over remote objects. A complete cure was effected by leeches to the temples, blisters behind the ears, and small doses of calomel followed by quinine. Dr. James Hunter relates a case, in which a cure was effected by purgatives.[6]

That this affection, in children, was the result of the feverish complaint by which it was preceded, could scarcely be doubted; and it seemed more likely to be the result of disturbance in the nervous power upon which the adjusting apparatus of the eye depends for its activity, than of any immediate change in the eyeball such as might cause a shortening of its axis, or of any derangement in the curvatures or densities of its dioptric media.

This variety of presbyopia, if we may be allowed to call it so, is easily distinguished from asthenopia, by the deficiency being constantly experienced till it yields to medical treatment; whereas the fits of long-sightedness in asthenopia, occur only after the eyes have been exercised for an appreciable time, perhaps for half an hour or longer, upon near objects, and during a short period of rest subside of themselves. The cases related by Mr. Ware[7], as occurring in young persons, seem to partake more of the character of asthenopia than of presbyopia.

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[1] Treatise on the Eye; Vol. ii. p. 70; Edinburgh, 1759.

[2] Philosophical Transactions; Vol. ciii. p. 42; London, 1813.

[3] Association Medical Journal, November 11, 1853, p. 996.

[4] Philosophical Transactions; Vol. ci. p. 380; London, 1811.

[5] Convex glasses are kept in the shops of every focal length, from 48 inches to 6. It is evident that no certain estimate can be formed from a person's age of the focal length of the glass which he will require; although perhaps the following may be received as a tolerable approximation to an average upon this head:—

Years of age	40	45	50	55	58	60	65
Focal lengths, in inches ...	36	30	24	20	18	16	14
Years of age	70	75	80	85	90	100	
Focal lengths, in inches ...	12	10	9	8	7	6	

The focus of a convex glass may be measured by holding it near the side of a room facing a window, or opposite to the sun, and moving it slowly backwards and forwards, until the image of the window-frame, or of the sun, upon the wall, becomes smallest and most distinct: the distance between the glass and the wall at that moment is the focal length.

[6] Edinburgh Medical and Surgical Journal, January 1840, p. 124.

[7] Philosophical Transactions; Vol. ciii. p. 48; London, 1813.

SECTION III.—IRREGULAR REFRACTION.

To insure perfection in vision, the dioptric media of the eye would require to be normal in curvature, density, and position. It is probable, however, that the lenses of the eye, and especially the cornea and the crystalline, are affected with irregularities in these respects more frequently than is generally supposed, and that few eyes, in fact, are perfectly free from them. When such an irregularity is slight, the effect is that an object, seen generally out of focus, but in some instances when placed at the distance of greatest distinctness, appears multiplied to the eye affected, a symptom which is called *uniocular diplopia;* while in aggravated cases, vision is exceedingly disturbed, and as the rays of light coming from a luminous point, and falling upon the whole surface of the pupil cannot be brought to a corresponding point within the eye, but at different distances converge in such a manner as to form two linear images at right angles to each other, the imperfection has received the name of *astigmatism.* If very considerable, such irregularities, especially when they affect the curvatures of the cornea, may perhaps be detected by the observer's watching the progress of a candle in front of the patient's eye, and noticing the appearances of the three reflected images. The patient may detect the existence of such irregularities by closing one eye, and directing the other to a very narrow well-defined luminous object, not too bright, (the horns of the moon, when a slender crescent, only two or three days old, are very proper for the purpose), and turning the head in various directions. The line will be multiplied, or variously distorted; and careful observation of its appearance, under different circumstances, may sometimes lead the patient to a knowledge of the peculiar conformation of the refracting surfaces causing those appearances, and may suggest the proper remedy.

§ 1. *Uniocular Diplopia.*

A layer of mucus, lying, as a soft solid, on the surface of the cornea, and not being parallel to it, is apt to cause a multiplied image, exactly as if the eye were directed through a plano-convex lens, the convex surface of which being ground into facets, it became a multiplying glass. Nictitation, in this instance, clears away the mucus, and the diplopia disappears.

A similar result will follow, if the surfaces of the cornea, or the crystalline, are not perfectly regular. If any malposition exists in regard to the successive surfaces of the dioptric media, from the cornea inwards; or if the pupil is filled with a net of threads, the result of fibrinous effusion; instead of the luminous rays which enter converging to a single focus, they will converge to two or more foci on the retina. A myopic eye always sees several superimposed images of the flame of a candle, when the object is placed considerably beyond the point of its distinct vision; and the presbyopic eye is apt to see the same thing, when the candle is placed near it. By moving towards the object in the one case, and from it in the other, the false images are made to disappear; and the same effect is produced by looking through a concave lens if the eye is myopic, through a convex one if presbyopic, and in either case by looking through a pin-hole, or through the meshes of fine wire gauze.[1]

It is rarely, if ever, the case that a patient complains of uniocular diplopia, unless the opposite eye from the one affected is so much impaired as to be useless. Then it is, that the double vision of the remaining eye proves annoying. The two centres of refraction are generally more or less oblique in respect to one another. Whether the eye is myopic or presbyopic, as the patient withdraws himself from the object regarded, the false image, which is paler and less sharply defined than the true, separates more and more in a direction obliquely upwards or downwards, till at last, in some cases, it fades and disappears. When the false image appears in a direction outwards and downwards, we may conclude that the cause of the diplopia resides in the inner and upper part of the eye.

Uniocular diplopia is sometimes a precursor of cataract.

Nothing positive is known as to the cause of uniocular diplopia. That, from malformation or disease, the vertices of the cornea and crystalline are out of their normal relation, or that the poles of the crystalline are not in the same straight line, are mere conjectures.

M. Prevost, at the age of eighty-one years, published[2] an account of his own case of double vision with a single eye, which he thought might perhaps arise from a fracture, bruise, or partial flattening of the lens, or separation of its laminæ. M. Prevost also communicated with Mr. Babbage, who is affected in either eye singly with double vision, a defect, however, which he finds himself able to remedy, by looking through a small hole in a card, or through a concave lens.

All that can be done for uniocular diplopia, is to use the palliative remedy afforded by a concave or convex lens, according as the eye is myopic or presbyopic.[3]

§ 2. *Astigmatism.*

From *α privative*, and *στίγμα, point.*

Numerous instances have been recorded, in which, from some defect in its refraction, the rays of light falling upon the eye are brought to a nearer focus in a vertical than in a horizontal plane, so that the eye, regarded as an optical instrument, is not symmetrical about its axis. We meet with many eyes in this condition, that if a straight black line, drawn on a sheet of paper, is presented in a vertical direction, it appears double, but the instant it is turned in a horizontal direction it is seen single.

Dr. Young tells us[4], that his "eye, in a state of relaxation, collects, to a focus on the retina, those rays which diverge vertically from an object at the distance of ten inches from the cornea, and the rays which diverge horizontally from an object at seven inches' distance." This would take place if the cornea, instead of being a surface of revolution, in which the curvature of all its sections through the axis must be equal, were of some other form, in which the curvature in a vertical plane was greater than in a horizontal. Dr. Young, however, considered the cause in his case to be an obliquity of the cornea and crystalline lens, with respect to the visual axis. The same effect might arise from the lens having one or both of its surfaces cylindrical, or from a want of symmetry in the variation of its density.

Professor Fischer, of Berlin, observed, that if he placed a number of fine parallel lines before him in a horizontal direction, he could count them when at the distance of from fifteen to twenty inches, but the instant he placed them in a vertical position they were undistinguishable, till he brought them to within six or eight inches of his eye. Looking at the bars of a window, with his head in the vertical position, the cross-bar appeared longer than it should have done; but with his head bent towards the shoulder, the vertical bar appeared elongated.[5]

A similar instance of irregular refraction has been adduced by Mr. Airy, Astronomer Royal, as existing in one of his own eyes.

Case 861.—Mr. Airy discovered that, in reading, he did not usually employ his left eye, and that in looking at any near object it was totally useless; in fact, the image formed in that eye was not perceived, unless attention was particularly directed to it. Supposing this to be entirely owing to habit, and that it might be corrected by using the left eye as much as possible, he endeavoured to read with the right eye closed, or shaded; but found that he could not distinguish a letter, at least in small print, at whatever distance from his eye the characters were placed. Some time afterwards, he observed that the image formed by a bright point, such as a distant lamp or a star, in his left eye, was not circular, as it is in the eye which has no other defect than that of being near-sighted, but elliptical, the major axis making an angle of about 35° with the vertical, and its higher extremity being inclined to the right. Upon putting on concave spectacles, by the assistance of which he saw distant objects distinctly with his right eye, he found that to his left eye a distant lucid point had the appearance of a well-defined line, corresponding exactly in direction, and nearly in length, to the major axis of the ellipse abovementioned. He found also, that if he drew upon paper two black lines crossing each other at right angles, and placed the paper in a proper position, and at a certain distance from the eye, one line was seen perfectly distinct, while the other was barely visible; while upon bringing the paper nearer to the eye, the line which was distinct disappeared, and the other was seen well defined. All these appearances indicated that the refraction of the eye was greater in the plane nearly vertical than in that at right angles to it; and that consequently it would not be possible to see distinctly by the aid of lenses with spherical surfaces. Mr. A. found, indeed, that by turning a concave lens obliquely, or on looking directly through a part near the edge, he could see objects without confusion; but in both cases the distortion produced was such, that he could not hope to make any use of the eye without some more effectual assistance.

Mr. Airy's object now was to form a lens which should refract more powerfully the rays in one certain plane, than those in the plane at right angles to it; and his first idea was to employ one whose surfaces should be cylindrical and concave, the axes of the cylinders crossing each other at right angles, and their radii different.

To show that this construction would effect the purpose, it is only necessary to imagine such a lens divided into two lenses by a plane perpendicular to its axis: thus it is easily seen that the refraction of one will not be perceptibly altered by that of the other, and that the whole refraction will be the combination of the two separate refractions. The rays in one plane will be made to diverge entirely by the refraction of one lens, and those in the other plane by that of the other lens. This construction then was sufficient; but, for the facility of grinding, and for the diminution of the curvatures, it appeared preferable to make one surface cylindrical, the other spherical, both concave.

To discover the necessary data for the formation of the lens, Mr. A. made a very fine hole with the point of a needle in a blackened card, which he caused to slide on a graduated scale; then strongly illuminating a sheet of paper, and holding the card between it and the eye, he had a lucid point upon which he could make observations with ease and exactness. Resting the end of the scale upon the cheek-bone, and sliding the card on this scale, he found that what was seen as a point when close to the eye, at the distance of 6 inches appeared a well-defined line, inclined to the vertical about 35°, and subtending an angle of (by estimation) 2°: at the distance of 3½ inches it appeared a well-defined line at right angles to the former, and of the same apparent length. It was necessary, therefore, to make a lens, which, when parallel rays were incident, should cause those in one plane to diverge from the distance 3½ inches, and those in the other plane from the distance 6 inches.

Having procured a spherico-cylindrical lens, of which the radius of the spherical surface measured 3½ inches, and that of the cylindrical surface 4½ inches, Mr. A. found that he could read the smallest print at a considerable distance, with the left eye as well as with the right. He found that vision was most distinct when the cylindrical surface was turned from the eye; and as, when distant from the eye, the lens altered the apparent figure of objects, by refracting differently the rays in different planes, he had the frame of his spectacles made so as to bring the glass pretty close to the eye. With these precautions, he found that the eye which he had once feared would become quite useless, could be used in almost every respect as well as the other.

"I believe it has generally been found," says Mr. Airy, "that where the direction of the axis is distorted, the sight of the eye is defective, but not lost; and the distortion is by many ascribed to the disuse of the eye which is occasioned by this defect. If it should be found that the defect is at all similar to that which I have described, it can be perfectly corrected. The examination of the defect, in the manner which I have detailed, is very easy; and it is merely necessary to write down fully the appearance of the brilliant point at different distances, in order to enable the theoretical optician to invent a glass which shall make the vision of the eye distinct. If the defects arise from insensibility of the nerve or opacity of the humours, they are beyond his power; but any fault in the refracting surfaces it is possible to correct."[6]

Having occasion, twenty years after the first account of the malformation of his left eye was submitted to the Cambridge Philosophical Society, to explain that a change had happened in the state of the eye, Mr. Airy took an opportunity of mentioning that as the nature of the effect of that malformation was, that the rays of light coming from a luminous point, and falling upon the whole surface of the pupil, did not converge to a point at any position within the eye, but converged in such a manner as to pass through two lines at right angles, the Rev. Dr. Whewell had affixed to this phenomenon the term *astigmatism*. Mr. A. further stated, that in the interval between 1825 and 1846, while the short-sightedness of his left eye had materially diminished, the fault which had produced the astigmatism had undergone very little or no alteration.

"Upon examining the right eye in the same manner," says Mr. A., "I find no perceptible fault. The image of a fine hole is a luminous point very sharply defined. The distance of accurate definition is as nearly as possible 4·7 inches; the same as the nearest distance at which the left eye forms a well-defined line for the image of a point. It would seem, therefore, that the normal formation of the two eyes is the same, and that the abnormal alteration in the left eye is of the nature of a refraction through a dense medium cylindrically concave, or through a rare medium cylindrically convex, superadded to normal refraction."[7]

The publication of Mr. Airy's case having directed attention to defects of vision from malconformations of the lenses of the eye, several other remarkable instances of the same sort have been recorded. One of these occurred in the right eye of Dr. Goode[8]; a second, in both eyes of a patient of Dr. Hamilton[9]; and a third, in both eyes of a clergyman in Philadelphia, whose case, related by himself, is published by Dr. Hays.[10] In Dr. Goode, the affection appeared to be hereditary, his mother having a defect of a similar nature in both eyes. Dr. Hamilton's patient, besides being astigmatic and myopic, laboured under night-blindness. On looking at a clock, he could not distinguish the hour, if the hands pointed vertically; but if horizontally, he found no difficulty. In all the three cases, a remedy was found in the use of lenses, plane on one surface, and concavo-cylindrical on the other. When a lens of the proper strength is procured, it is found to correct the error in all states of adaptation of the eye. Hence the error is independent of the state of adaptation. If a person affected with astigmatism be obliged to employ also convex or concave glasses, the curvature necessary to correct the astigmatism may be combined with the curvature necessary on account of the presbyopic or myopic state of the eye. A cylindrical lens produces no convergency or divergency in parallel rays, incidental in the plane of its axis; whilst it converges or diverges rays in a plane at right angles to the axis, as a spherical surface of equal curvature would do. If, then, such a cylindrical surface be conjoined with a spherical one, the focus of the spherical surface will remain unaltered in one plane, but in the other will be changed to that of a lens formed by it, and a spherical surface of equal curvature with the cylinder.[11]

The required curvature of the cylindrical surface is directed to be calculated by means of the distances of the card from the eye when the two focal lines are formed; but it is sometimes found difficult to prevent the eye from altering its state of adaptation during the measurement of the distances. To meet this difficulty, Professor Stokes, of Cambridge, has constructed an instrument for determining the nature of the required lens, an account of which he communicated to the British Association for the Advancement of Science, at their meeting in 1849.[12]

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[1] Cranmore, Philosophical Magazine, June 1850, p. 485.

[2] Annales de Chimie et de Physique; Tome li. q. 210; Paris, 1832.

[3] On Uniocular Diplopia, consult Heyfelder, Ammon's Zeitschrift für die Ophthalmologie; Vol. iv. p. 189; Leipzig, 1834: Steifensand, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. xxiii. p. 80; Berlin, 1835: Szokalski, De la Diplopie Uni-oculaire; Paris, 1839.

[4] On the Mechanism of the Eye; Philosophical Transactions, for 1801.

[5] Gerson, De Forma Corneæ, p. 17; Gottingæ, 1810.

[6] Transactions of the Cambridge Philosophical Society; Vol. ii. p. 267; Cambridge, 1827.

[7] Ibid.; Vol. viii. p. 361; Cambridge, 1849.

[8] Ibid. p. 493: and Monthly Journal of Medical Science, April, 1848, p. 711.

[9] Ibid., June, 1847, p. 891.

[10] Lawrence on Diseases of the Eye, edited by Hays, p. 669; Philadelphia, 1854.

[11] Herschel, Encyclopædia Metropolitana, article *Light*, p. 398, § 359: Airy, and Goode, Op. cit.: Brewster, Edinburgh Journal of Science, October, 1827, p. 325.

[12] Notices of Communications to the British Association, 1849, p. 10; London, 1850: Cooper on Near-Sight, &c., p. 219; London, 1853.

SECTION IV. — PHOTOPSIA.

Syn.—Photopsia, from φῶς, *light*, and ὄψις, *vision*. Μαρμαρυγή; *Hippocrates*. Visus lucidus.

It is evident, that in health we should suffer no imitations of visual sensations, no flashes of light from internal changes in the eye, no false perceptions of any kind; that we should see objects of their natural colours, not tinged with hues entirely foreign to them, or of which they in general appear to be free; and that we should have the consciousness of being impressed by the view of external objects, only when such objects are present, and actually affecting our organs of vision. Yet such is the constitution of the optic apparatus, that by various derangements to which it is liable, we become the subjects of many sensations, which have actually no prototype. Even a mere defect of power in this apparatus, frequently gives rise to such phenomena.

In this, and some of the following sections, we shall notice the most remarkable false visual sensations. The first is what is called *photopsia*.

That sensations of light may be excited independently of the ordinary impressions from external objects, is familiarly known. The flash, produced upon sneezing, or by gentle pressure, or a sudden blow on the eye, or by the passage of the Galvanic influence through different parts of the face, as in the simple experiment of applying a piece of zinc and a piece of silver to the tongue, and then bringing them into contact, affords sufficient proof, that the retina may be so affected, as to produce the sensation of light, altogether independently of the actual presence of light. In the last three cases, the effect is produced whether the eyes be open or closed, and in all of them, whether the experiment be made in daylight or in the dark.

The simplest illustration of photopsia, as well as of another pseudo-sensation called chrupsia, or coloured vision, is thus noticed by Newton in Query 16., at the end of his Opticks: — "When a man in the dark presses either corner of his eye with his finger, and turns his eye away from his finger, he will see a circle of colours like those in the feathers of a peacock's tail. If the eye and the finger remain quiet, these colours vanish in a second minute of time; but if the finger be removed with a quivering motion, they appear again." This experiment affords an example at once of photopsia and of chrupsia, produced by artificial pressure on the convex surface of the retina.[1]

In like manner, there are sensations of light, which are altogether the result of disease in the optic apparatus. Flashes of light, the appearance of shining stars, a glittering as if from the points of innumerable needles, or the sides of innumerable prisms, and a variety of other lucid spectra, attend choroiditis (see p. 569.), and occur in the commencement of the congestive varieties of amaurosis. In some peculiar and distressing cases of ocular hyperæsthesia, the patient is annoyed by the sensation as if his eyes were directed towards globes of light swimming or revolving before him, or as if he were looking at a sea of molten gold.

The distress which patients affected with such false sensations experience, varies greatly in degree; but, on the whole, these lucid spectra are much less supportable by those who experience them, than the dark or semi-transparent appearances, fixed or floating, which so frequently occur, and which are called *muscæ.*

Photopsia may result from irritation of any portion of the nervous optic apparatus, from its peripheral termination in the retina to its central origin in the corpora quadrigemina: exactly as disease of the pons Varolii or of the Gasserian ganglion will cause neuralgia of the fifth nerve, so may the patient be troubled with flashings and coruscations, if the optic nerve, or its origin in the brain, be affected with disease.

Any cause operating on either surface of the retina, so as to produce gentle pressure of its nervous substance, excites a luminous sensation, whereas if the pressure is much increased, the membrane becomes for the time totally insensible.

When one looks fixedly for a few minutes at the clear sky, a multitude of minute lucid points begins to be visible, darting in every direction through the field of vision. The motion of the points is real, and altogether independent of any movement of the eyeball; and is so exactly like that of the circulation in the web of a frog's foot as seen in the microscope, that it cannot be doubted that this spectrum is owing to the blood passing through the vessels either of the retina or of the choroid.

A perception of this *circulatory spectrum*, in the ordinary use of sight, and not searched for by gazing steadily at the sky, is, in some cases, one of the earliest symptoms of amaurosis, degenerating gradually into the sensation of gleams of light, fiery sparks, and coloured coruscations. After a time, the pressure on the retina still continuing and increasing, these luminous appearances are changed for others of a totally opposite character, namely, such as are known as *fixed muscæ.*

Those who have suffered from internal ophthalmia are often troubled with such sensations as that of a luminous ring whirling before them; subjects inclined to apoplexy, on raising their heads after stooping, see showers of shining spectra; and flashes of light are often the precursors of convulsive attacks, such as epilepsy. Similar feelings occur, as insensibility approaches, in those who have inhaled ether or chloroform. The inhalation of nitrous oxide also produces trains of vivid spectra. Phrenitis is attended by false impressions of the same sort, which often continue long after all the other symptoms have ceased. In cases of hypertrophy and dilatation of the heart, the patient frequently suffers from dazzling of the sight, as well as from obstinate pain in the head, and other cerebral symptoms. In some instances, photopsia is merely a sympathetic effect produced from disordered stomach, or the ingestion of some poisonous substance. Digitalis is well known to have this effect. I have known tea, taken to breakfast, and suspected to contain a mixture of the leaves of some poisonous plant, blamed for producing photopsia, the patient having a sensation of silvery zigzag lines vibrating before him, with dimness of sight, and *visus interruptus,* so that the word or letter looked at could not be seen, symptoms which subsided in an hour or two. After fever, or any disease in which the patient lies long in the horizontal position, photopsia is liable to occur, but is generally got quit of as the patient becomes able to sit up.

It is of great importance, in every case, to trace photopsia to its proper cause, and to distinguish it accurately from photophobia. (See pages 180, 484.) The latter often simulates the former, especially in scrofulous, hypochondriacal, and hysterical patients. The cause of photopsia being discovered, the line of treatment can scarcely be mistaken. Sir David Brewster tells[2] us of a case, in which the patient had constantly the sensation of a luminous circle before him, in consequence of an excrescence on the inside of the eyelid, which produced a continued pressure on the eyeball. The removal of the excrescence would afford a cure in this case. When photopsia is owing to cerebral congestion, depletion will be necessary; when dyspepsia is the cause, emetics and purgatives, followed by tonics, will be proper.

The following interesting case of photopsia has been recorded by Mr. Ware, in the words of the patient himself, a medical practitioner.

Case 862.—"About ten years ago, when about 48 years of age, I experienced the first attack of the malady which I mean to describe; and it has repeatedly returned, at irregular periods, from that to the present time. The first notice that I have of the attack is a peculiar indescribable sensation at the bottom of the eye, which does not amount to pain, and is so slight that its reality is not to be determined unless I direct my attention very particularly to it. After a few seconds, the objects in a small point nearly in the centre of the field of vision become indistinct, and shortly afterwards invisible.

* * * *

In a few seconds more, that is, in about half a minute from the commencement of the attack, the point that was invisible becomes lucid, appearing to be a circular spot, about the eighth of an inch in diameter, in which a yellow flame seems to undulate from the centre to the circumference with almost coruscating quickness and splendour. This spot increases by the extension of the undulating flame until it acquires an apparent diameter of about three quarters of an inch, which takes place generally in about six or eight minutes. The fiery veil which conceals objects becomes then thinner in the centre, and objects are there seen through it. The vision increases, until at length a ring of light only remains, which continues to enlarge until it is lost by seeming to extend beyond the field of vision.

"The returns of the attack have been very irregular. Sometimes they have occurred daily for a week or ten days together; at other times, more than a month has elapsed between their appearance. During one forenoon they returned almost every hour; but of late the intervals are much lengthened, and I have been now exempted from the malady more than three months.

"At first no pain was felt; but during the last 12 months, a slight uneasiness under the forehead, on the opposite side to that of the affected eye, has generally accompanied and succeeded the attack.

"The disease is common to both eyes, though it has never yet occurred in both at the same time. My sight is not injured, though the sensibility of the retina appears to be morbidly increased: a strongly illuminated object producing a more brilliant spectrum than it used to do.

"About six weeks ago, I first saw the unpleasing appearance of a small dark circular spot, which, varying its situation with every motion of the eye, showed how appropriately the term 'musca volitans' had been applied to it. The possibility of its being a partial paralytic affection, resulting from the frequent morbidly increased action of the retina, naturally alarmed me; but six weeks having elapsed without any return, I am become easy concerning it. In this instance, the immediate cause of the affection appears to have been an irregularly increased action of the retina; and the remote causes were an over eager exercise of the mind, joined with too long continued employment of the eyes, and a disordered state of the stomach and bowels.

"With regard to the means of cure, reprehensible as it may appear, I for a long time employed none. About three years ago, however, having been harassed repeatedly at short intervals, and sometimes two or three times in the day, by the above-mentioned appearances, I called on you, and, by your advice, took a dose of five grains of calomel. After this, the spectrum did not appear for several months; and when I again saw it, it yielded to a repetition of the same remedy. In the following year, having travelled two days together, and taken food of an improper kind and in an irregular manner, the attacks on the third morning were so frequently repeated, that I was unable to see my way without difficulty and danger. I therefore stopped, and took my dose of calomel; after which the spectrum immediately disappeared, and it did not return for many months. That which was black, as well as those which were lucid, were equally removed by the use of this medicine; and I have not now perceived either of them for a considerable length of time."[3]

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[1] The production of a lucid and coloured spectrum, referred to in the text, has been styled *phosphène* (from φῶs, *light*, and φαίνω, *I make appear*), by M. Serres, of Uzès, by whom (Annales d'Oculistique, Tome xix. p. 76; Tome xxiv. pp. 31, 160, 247; Tome xxv. p. 126; Bruxelles, 1848, 1850, 1851; Bulletin Général de Thérapeutique, Tome xlvi. p. 490, Paris, 1854) the experiment of making pressure on the eyeball has been recommended as a means of discriminating the diseases of the retina and optic nerve from those which affect the crystalline, the iris, and the other parts in front of the retina. In amaurosis, glaucoma, and other affections of the nervous parts, the spectra are found to become faint in proportion as the nervous powers are impaired; and are entirely absent when the visual sensibility is lost. On the other hand, in those numerous affections of the eye where the rays of light can no longer form images on the retina, on account of the opacity of the parts which they have to traverse, the ocular spectra are found to be unimpaired in their brightness. This refers only to spectra produced by pressure on the eyeball; for (as is stated by Müller, Elements of Physiology, translated by Baly, Vol. ii. p. 1072, London, 1842) luminous spectra may be produced by internal causes affecting the brain, in complete amaurosis, or even after extirpation of the eyeball.

[2] Philosophical Magazine, August, 1832, p. 90.

[3] Medico-Chirurgical Transactions; Vol. v. p. 274; London, 1814: See case of M. Savigny, Archives Générales de Médecine, Aout, 1838, p. 495.

SECTION V.—CHRUPSIA.

Syn.—Chrupsia, from χρόα, *colour*, and ὄψις, *vision*. Visus coloratus. Iridiscent vision.

Patients, who are incompletely amaurotic, complain not unfrequently of luminous objects, as, a lighted candle, appearing to be surrounded by the colours of the rainbow. This symptom, which is called *chrupsia*, may depend either on some derangement of the lenses of the eye, by which its achromatic power is disturbed, or on some irritation, from pressure or otherwise, of the convex surface of the retina, or of some portion of the optic nerve. We have thus two varieties of chrupsia, the *dioptric* and the *nervous*.

Any one may produce *dioptric chrupsia*, by causing the image of an external object to fall upon the retina, out of its focal distance. If a white object upon a black ground, or a black object upon a white ground, is held before the eyes nearer or more distant than the distance to which the eyes are at the time adjusted, the object will appear double, indistinct, and surrounded with fringes of colour. Such fringes may occur as a symptom of an affection of the adjusting apparatus, without any change in the retina. Müller notices[1] as an instance of this phenomenon, the red border which surrounds the letters of a book, when the adjusting power is paralysed by passion, mental exertion, or inclination to sleep. Dioptric chrupsia occurs, also, when we suspend the adjusting power, and dilate the pupil, by belladonna.

As a variety of dioptric chrupsia, may be mentioned the yellow hue which objects assume in certain cases of jaundice. In common, patients with this disease do not perceive any change of colour in the objects around them; but when the humours of the eye and the cornea become deeply tinged with the bile, then all objects appear arrayed in yellow. Dr. Mason Good experienced this in his own case.[2]

A patient under my care with prolapsus of the nasal portion of the iris through an accidental wound of the cornea, saw all objects of a greenish hue.

Nervous chrupsia also presents its varieties; according as it arises from an affection of the retina or of the brain, and according as it tinges objects with some uniform but unnatural hue, or fringes them with the prismatic colours.

A young lady, whom I attended for scrofulous sclerotitis, saw brilliant blue, green, and red colours playing over the objects she regarded, such as the face of a person sitting before her, or a white handkerchief held in her hand. I judged this to arise from pressure on the retina.

Boyle[3] mentions iridescent vision as the earliest symptom complained of by those infected with the plague. This symptom continued for about a day, and was generally removed by the operation of a vomit. He records also a case of iridescent vision arising from a fall on the head near the eye, in which this symptom continued for five or six weeks.[4]

Patouillat records[5] the case of nine persons being poisoned by roots of henbane, which were mistaken for parsnips. Being treated, some by tartar emetic, and others by theriaca, they recovered; but during the first day after being poisoned, they saw double, and during the second day after, all objects appeared to them as red as scarlet.

A patient told Dr. Conolly, that for a time, after an attack of paralysis, everything appeared to be green.[6]

Dr. Parry relates[7] four cases, in which the patients saw objects of a different colour from what was natural to them. In one of these, an old general, just before the lighting of the candles in the evening, and for an hour on first waking in the morning, saw all white objects of a deep orange colour, approaching to scarlet. In another, a lady often saw white objects of a very bright blue colour.

Case 863.—In the month of July, a lady of advanced age went from London to the eastern coast of Kent, where she lodged in a house looking immediately upon the sea, and of course very much exposed to the glare of the morning sun. The curtains of the bed in which she slept, and also of the windows, were of white linen, which made her apartment very light. When she had been there about ten days, she observed, one evening, at the time of sunset, that first the fringes of the clouds appeared red, and soon after, the same colour was diffused over all the objects around her. It was particularly conspicuous when she regarded anything white, as a sheet of paper, a pack of cards, or a lady's gown. This lasted the whole night. The next morning her sight was perfectly restored. But as the evening advanced, the same appearances came on again; and they continued to do so regularly every evening, as long as she remained at that place, which was three weeks from the commencement of her complaint: the natural vision always returning in the morning. Six days after she had left the coast, Dr. Heberden saw her in London, still subject to the same affection. It persevered a fortnight longer, and then, of its own accord, ceased suddenly and entirely. While it was upon her, the sight seemed to be no otherwise impaired than by the degree of indistinctness necessarily produced by this unnatural colour, which overspread all her view.[8]

There seems every reason to suppose that this lady's complaint was brought on by her being exposed to an unusual glare of light; and it may be doubted whether it did not partake as much of the nature of an ocular spectrum as of those affections which are classed under the head of chrupsia.

In supposed cases of chrupsia, whether dioptric or nervous, it will be proper to guard against our being deceived, on the one hand, by those causes which might induce a decomposition of the rays of light by inflection merely, such as the bringing of the eyelids pretty close together, and on the other, by such as might give rise to ocular spectra.

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[1] Elements of Physiology, translated by Baly; Vol. ii. p. 1161; London, 1842.

[2] Study of Medicine; Vol. i. p. 420; London, 1829.

[3] Experiments and Considerations touching Colours, p. 14; London, 1670.

[4] Ibid. p. 17.

[5] Philosophical Transactions; Vol. xl. p. 446; London, 1741.

[6] Inquiry concerning the Indications of Insanity, p. 238; London, 1830.

[7] Collections from the unpublished Medical Writings of C. H. Parry, M.D.; Vol. i. pp. 560, 568, and 569; London, 1825.

[8] Medical Transactions of the College of Physicians; Vol. iv. p. 56; London, 1813.

SECTION VI.—OCULAR HYPERÆSTHESIA.

The very remarkable state of disease, which I purpose to designate by the name *ocular hyperæsthesia*, appears to consist chiefly in a greatly increased sensitiveness both of the optic nerve, and of the ophthalmic division of the fifth. The chief characteristic of the affection is great intolerance of light, with which are combined, in a greater or less degree, photopsia, chrupsia, pain in the eye and head, augmented tactual sensibility of the eyeball and eyelids, and spasmodic contraction of the orbicularis palpebrarum. So far as the disease implicates the fifth nerve and the portio dura of the seventh, it appears to be the effect of a reflex action communicated to them, in consequence of the excited state of the retina and optic nerve.

The disease occurs both in an acute and in a chronic form; the former generally arising suddenly from some evident external cause, reaching its greatest degree of severity in a few hours, and, after some days, either yielding speedily to treatment, or rapidly subsiding of itself; the latter rarely traceable to any particular excitement of the organ of vision, but seeming to depend rather on the state of the constitution, gradually increasing in violence during a number of days or weeks, often continuing severe during many months, proving scarcely amenable to treatment, apt by its long continuance materially to compromise the general health of the patient, merging sometimes into a state which we might be tempted to call *ocular hypochondriasis*, but ultimately undergoing a perfect and almost spontaneous cure.

In the acute variety, one eye is generally first affected, but by and bye both become implicated. I have, however, seen the reverse of this, both eyes suffering at the commencement, while the disease concentrated itself speedily in one eye only. The attack commences with such excruciating pain in the eye, as causes the patient to shriek aloud, and sometimes to fall suddenly to the ground. He is rendered totally incapable of exposing the eye to the light, and he immediately seeks to relieve this symptom, by remaining in the darkest place to which he has access, pressing his eyes with his hands, or lying on his face in bed, and pressing his eyes against the pillow. The spasm of the orbicularis palpebrarum is such, that it is almost impossible to obtain a glimpse of the eye. The pulse is full and quick, and the head hot. The symptoms are so severe that the patient concludes his sight to be lost, and the practitioner, if unacquainted with the true nature of such cases, perhaps adopts the same idea, and pronounces the disease to be acute retinitis.

The following cases illustrate the causes, as well as the course, of acute ocular hyperæsthesia.

Case 864.—A soldier, of sanguine temperament, exposed during military exercise to the heat of a July sun, fell suddenly, and then ran screaming to his tent, where he sought to exclude himself entirely from the light. As he was known to be one who endeavoured to evade duty, the drill-sergeant thought he was playing off a trick, and sent him to the guard-house. He continued to seek the darkest corner of the place where he was confined, and uttered the most piercing cries if an attempt was made to take his hands from his eyes. He was immediately sent to the camp-hospital at Beverloo, and placed under the care of M. Cunier, 1st July, 1838. In the darkest part of the ophthalmic ward, he lay on his belly, with his head between his hands, groaning loudly. M. Cunier sought to open his eyelids; but their spasm was so violent that he could not accomplish it. Once he succeeded in separating a little way the left eyelids, when the patient threw himself back, and a profuse flow of tears took place from both eyes. He was bled to 20 ounces; mercurial ointment, with belladonna, was used in friction; a pediluvium, with mustard, was employed; and the room kept dark. At the evening visit, there was a slight amelioration. The pediluvium was repeated.

2nd July.—Patient in the same state as yesterday evening. Four drachms of mercurial ointment, with extract of belladonna, to be used in the day. Thirty grains of tartar emetic to be divided into six doses, one of which is to be taken every two hours. Pediluvium, with mustard. In the evening, a diminution of the palpebral spasm. M. Cunier could half open the eyelids. The eye was but slightly inflamed; the pupil was much contracted.

3rd July.—The same remedies were continued, and blisters applied to the temples.

The disease continued to abate till the 6th, when the patient desired to be led out of doors. The photophobia returned, and with it there was constant photopsia. Five grains of tartar emetic were given in four doses, a dose every two hours; six drachms of mercurial ointment, with extract of belladonna, were ordered; pediluvium, with mustard; an irritating application to the blisters.

7th July.—Scarcely any photophobia; no photopsia; the revulsives continued.

9th July.—Began to use the eyes, the retina becoming less and less irritable.

15th July.—Completely cured.[1]

Case 865.—Mr. G., a gentleman of remarkable skill in minute and microscopical dissection, was engaged, on Friday, 29th March, 1844, in dissecting the nerves of the human tongue, under a powerful microscope, and in a situation exposed to the full influence of the sun, which, although occasionally obscured, burst forth at times with great power. The nerves, having been cleanly dissected, were of a dazzling whiteness; and whilst he was intently regarding them through the microscope, the sun suddenly shone forth with all its brilliancy upon them. Acute pain was instantly felt in the eye, pervading the whole globe, so severe as to cause Mr. G. to start back and utter an exclamation. He paused from work; but for some time was unable to see anything with that eye, the spectrum of the sun continuing before it, whether closed or open. In about twenty minutes, however, this, as well as the pain, had sufficiently subsided to enable him to resume work with the other eye; but the injured organ was not free from uneasiness until the evening.

The following day, the eye was not painful, and he incautiously used it in completing his dissection; when the very same occurrence took place as on the previous day, the reflected rays of the sun being thrown powerfully upon the retina. The shock was excessive; deeply seated pain, pervading the whole globe, with much intolerance of light, immediately set in, and the spectrum of the sun was most distressing. He remained in this state all the evening and following night.

Next day, his sufferings continued to increase, with a sensation of fulness and tenderness of the globe, and extreme intolerance of light. Fomentations failed to afford relief.

On Monday, when the patient consulted Mr. White Cooper, the following were the symptoms:—Acute, deep-seated pain in the eye; exquisite tenderness, especially at the upper half of the globe; great intolerance of light; profuse lacrymation; any attempt at vision produced luminous spectra; pupil contracted; iris natural; conjunctiva but slightly injected; pulse feeble and irritable; he complained of weakness and mental depression. He was sent to bed in a darkened room, and ordered to apply twelve leeches around the eye, to foment, and to take a purge. Mercury, he stated, always disagreed with him, and was therefore used with great caution.

Next day he was rather easier: friction of the brow and temple with mercurial ointment and opium was directed; blue pill, with conium, was ordered at night, with saline draughts and antimony at intervals.

The following day, all the symptoms were alleviated. The antimony was omitted, but the mercurials continued. On Thursday, a still greater improvement was manifest, the eye being perfectly free from pain, except when exposed to the light; there was, however, great debility and general exhaustion. Half a grain of quinine, twice a-day, with a moderate meat diet, was ordered, the mercurial friction being continued. This treatment, with counter-irritation behind the ear, and the use of a mild astringent collyrium, was steadily pursued for a week, with advantage; although the least exertion of the eye immediately produced luminous spectra. The further treatment presented nothing remarkable; the eye steadily and perfectly recovering.[2]

Called to visit a patient with chronic ocular hyperæsthesia, we are probably ushered into a room as absolutely dark as it is possible to make it, every chink by which light might enter being closed, and a large screen so placed as to impede any gleam which might intrude on the door being opened. There we find the patient, in some cases sitting up, in others lying in bed, with his eyes shaded, and his head covered with a thick veil or shawl. In this state, we are perhaps informed, he has been for months. In such a case, no persuasion will convince the patient that he might bear, for a few moments, sufficient light to enable us to see his eyes; or if he yields so much as to remove the coverings from them, his terror of their being touched with the finger prevents us from making any satisfactory examination of their state. The increased sensibility of the fifth nerve is a symptom scarcely less prominent in such cases than the excessive intolerance of light. The least touch about the eye is painful, and continues to be felt for a long time.

There is, in general, both in the acute and in the chronic variety of ocular hyperæsthesia, a combination of blepharospasm, of photopsia, and often also of chrupsia, such as I have already (pp. 180. 929. 932.) described them. Yet it is remarkable, that there may be neither photopsia, chrupsia, nor spasm of the eyelids. I have met with cases in which, though the smallest degree of light was insufferable, so that the patient remained in complete darkness, and his eyes shaded lest any accidental ray might reach them, yet his eyes were open and affected neither with spasm of the orbicularis palpebrarum, nor with any subjective sensations of light.

Although severe pain always attends the acute variety of the disease, the feelings of this kind which are present in chronic cases vary greatly. In some, they are pretty acute, being concentrated in the eyeball, or extending to the forehead and temples. In others, scarcely any complaint is made of pain.

I have known patients for many months affected with chronic ocular hyperæsthesia, their power of vision remaining acute, and not at all impaired from their continuing so long in the dark. Indeed, the acuteness of their sight has sometimes appeared to be increased beyond what is ordinary, so that, in a state of almost complete darkness, they managed to see sufficiently to take their food, and to distinguish readily the furniture in their room and the persons about them. Dilatation of the pupil may be partly the cause of this approach to *oxyopia*; partly it may be attributed to the forced tranquillity of the retina rendering it fit, after a time, to receive impressions such as otherwise would be too faint to be perceived.

Diagnosis. — From the photophobia of scrofulous or any other ophthalmia, we distinguish ocular hyperæsthesia by the age of the patients, and by the absence of redness of the eyes. From retinitis it is distinguished by the excessive pain and intolerance of light, symptoms which do not attend inflammation of the retina; and by the complete and generally sudden restoration to the exercise of vision which happens in hyperæsthesia, whereas the recovery from retinitis is slow and uncertain. After recovery from hyperæsthesia, there is no evidence that the nutrition of the retina, nor of the other structures of the eye, had been at all interfered with; retinitis generally leaves both the nerve of vision, and other parts of the eye, seriously compromised in texture and function.

Subjects. — The subjects of ocular hyperæsthesia are oftenest young adults. I have met with it, however, in persons far advanced in life. It is more apt to affect females than males. It does not seem connected necessarily either with a plethoric or with an anæmic state of the circulation. The eyes of those affected are generally normal in construction, although I have met with the disease in eyes that were myopic and affected with oscillation.

Causes. — As causes of the acute variety may be mentioned, 1. Exposure to intense light and heat. 2. Over-use of the eyes, as in microscopic observations. 3. The influence of lightning. 4. Febrile affections, in which the brain suffers much. Such causes are often awanting in the chronic variety, and then its origin is obscure. In females, it sometimes appears to be an hysterical affection, or to depend on irregularity of the catamenia.

Prognosis. — However severe the symptoms, we may, both in the acute and in the chronic variety, promise a perfect recovery. In the acute, the recovery is generally sudden; in the chronic, gradual, but sometimes sudden and complete. The long duration of the chronic affection sometimes operates unfavourably on the nutrition and general strength of the patient, so that he continues feeble and reduced in body after his ocular symptoms are entirely subdued.

Treatment. — Acute cases, from the violence of the pain by which they are attended, have generally been treated by depletory measures, such as venesection and the application of leeches, followed by calomel, with opium, and, after a time, by sulphate of quina. I have known a complete cure effected by this plan of treatment. In a severe case, to which I was called, in which leeches and counter-irritation had been employed, neither the internal use of tincture of belladonna, nor fomentations with opium and belladonna, were of any avail; but as soon as the mouth became sore from the administration of calomel and opium, the symptoms were overcome, and the cure was completed under the use of the citrate of iron and quina.

The intolerance of light, in both the acute and the chronic variety, yields for a time to the anæsthetic effect of inhaling the vapour of sulphuric ether or chloroform; and I have known the repeated use of this means produce permanent relief.

The vapour-bath is a means which proves very beneficial in chronic cases.

The re-establishment of the general health, after the more distressing symptoms have yielded, may be greatly promoted by change of climate, and especially by passing the winter in the southern parts of Europe.

When the eyes are extremely intolerant of light, the best sort of shade is one formed of several layers of black crape, or black silk, mounted on a light frame of silver or brass wire, embracing the upper half of the face like a mask, but sufficiently hollow not to come into contact with the eyes.

In cases of less severity, shaded glasses may be employed, those for day-use being neutral tinted, those for night-use blue.

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[1] Annales d'Oculistique; 1er Vol., Supp. p. 48; Bruxelles, 1842.

[2] Lancet, July 6, 1844, p. 487. See case of acute ocular hyperæsthesia, by Taylor, Medical Times and Gazette, June 5, 1852, p. 559: Cases from lightning, by Mayo, Medical Gazette; Vol. ii. p. 58: by Lawrence, Treatise on Diseases of the Eye, p. 481; London, 1841.

SECTION VII. — OCULAR SPECTRA.

Syn. — Adventitious colours, *Boyle.* Couleurs accidentelles, *Buffon.*

A short notice of this class of phenomena will not, I think, appear out of place, if we consider that they are the result of fatigue of the eye, or, to use the expression of Porterfield, of a "too violent agitation excited in the retina," and that fatigue or agitation of this kind may not only be regarded as in itself a disease, but is the prelude often to other diseases of more permanent character. As we proceed, we shall find that the phenomena of ocular spectra connect themselves, also, with various other parts of our subject.

As long as the condition into which the stimulus of light has thrown the retina endures, the sensation also remains, though the exciting cause or visual object should have ceased to act. The interval in which the sensation continues is extremely short, not exceeding in ordinary cases from 3 to 4 tenths of a second; yet upon this *persistance of sensation* depends the fact, that in the act of winking, we never lose sight of the objects at which we are looking. Even after this interval, the retina does not suddenly and completely return to the state in which it was before being submitted to the excitement of impression. To the actual sensation, there follows what is called the *after-sensation* or *spectrum*, the duration of which is proportionate to the intensity and duration of the impression which caused it.

If we look for a short time at a window from the end of a long apartment, and promptly closing the eyes, turn them from the window and cover them with the hand, we perceive an accurate representation of the window, with the bars dark and the panes bright. This appearance, called a *direct ocular spectrum*, is instantly succeeded, if we turn the closed eyes towards the light and remove the hand, by a *reverse ocular spectrum*, or *complementary picture*, in which the bars appear bright, and the panes dark. This spectrum continues for a considerable space of time; its duration may be prolonged, by passing the hand up and down before the closed eyes, so as to permit the light to fall upon them only at intervals; and it is lost at length, only after a series of oscillations, in which it appears and disappears alternately.

If we look steadily for a considerable time upon a spot of any given colour, placed on a white or black ground, it will appear surrounded with a border of another colour; for instance, if the spot be red, a green border will appear, and if we direct our eyes to another part of the white or black ground, we shall perceive a spot of green of the size and form of the red spot. By similar experiments the *opposite* or *accidental colour*, as it is termed, of every tint may be found. Thus, the spectrum which is seen by fatiguing the eye with looking at a green object, is red; that of a violet object is yellow: that of yellow, violet. These are therefore called *opposite colours.*

If the impression of a luminous object on the retina be very intense, as when we look steadily at the setting sun, the spectrum assumes a variety of different colours in succession.

From the ocular spectrum of an object being often of a colour different from that of the object which has produced it, Boyle[1] gave to the colours which arise in this way the name of *adventitious colours*, while Buffon[2] called them *accidental colours*, in order to distinguish them from those produced by the elements of white light naturally reflected from external bodies.

To understand the meaning of the term *complementary*, as applied to such colours, it is necessary to observe, that the colour of the spectrum is always such as being added to the colour of the object with which the retina has been fatigued, makes up the sum of the three primary colours, red, yellow, and blue, which by their combination form white light; hence the name *complementary*, which has been given to the colours of ocular spectra. Green, then, which is composed of yellow and blue, is the complementary colour to red; violet, a compound of red and blue, to yellow; and orange, a mixture of red and yellow, to blue. Two colours, which together yield a gray colour, such as black and white, are also *complementary*.

From what has already been stated, the reader will see the propriety of arranging ocular spectra, with Müller[3], into three classes.

The explanation given by that physiologist of the *first* class, namely, colourless spectra after colourless images, such as the reverse spectrum of the bars and panes of the window, is this: — The part of the retina which has received the luminous image remains for a time in an excited state, while that which has received a dark image is in an unexcited, and therefore much more excitable, condition. The eye in this condition being directed towards a white surface, the luminous rays from this surface produce upon the excited parts of the retina a much more feeble impression than upon the other parts which are as yet unexcited, and therefore more susceptible of their action. Hence, the parts of the retina upon which the dark portions of the previous image had fallen receive a more intense impression from the white surface than those upon which the luminous portions of the image were directed, and thence the inversion of the light and dark parts of the image in the spectrum.

A succession of coloured spectra from the impression of colourless objects, as is the case after looking at the sun, constituting the *second* class, cannot be explained by any external conditions acting on the eye, and thus afford proof that colours have their immediate cause in the conditions of the retina itself.

Coloured spectra from coloured images, which form the *third* class, have generally been explained on physical principles as follows: — White light contains all the colours as its elements. The retina, when long fixed on a red object, is rendered insensible to the red light, but is still susceptible of the impression of the other coloured rays; if it be now directed towards a white surface, being no longer sensible to the red rays contained in the white light, it perceives only the remaining component rays of white light — those which produce the colour complementary of red, namely, green.

At variance with this explanation is the fact, that coloured spectra from coloured objects appear, although the eyes are in total darkness; so that there remains only the physiological explanation, which is this: — The perception of any of the three simple colours consists merely in the retina being in one of those conditions to which it has a tendency when in a state of excitement; if this condition be artificially excited in an intense degree, the retina acquires an extreme tendency to that of the complementary colour, which, consequently, is perceived as the ocular spectrum.

The following miscellaneous facts regarding ocular spectra appear worthy of notice. For the full illustration of them, the reader may consult the works mentioned in the note.[4]

1. Though a certain quantity of light facilitates the formation of reverse spectra, a greater quantity prevents their formation, as the more powerful stimulus excites even the fatigued parts of the eye

into action; otherwise we should see the spectrum of the last viewed object as often as we turn our eyes.

2. All experiments upon ocular spectra are apt to be confounded, if they are made too soon after each other, as the remaining spectrum will mix up with the new ones. This is a very troublesome circumstance to painters, who are obliged to look long upon the same colour; and in particular to those whose eyes, from natural debility, cannot long continue the same kind of exertion. One accidental colour, however, cannot be added to, or combined with, another. When the eye sees an accidental colour, suppose *red*, the excited part of the retina is insensible to all other rays but those of the accidental colour. If the same portion of the retina is instantly excited by another object, productive of an accidental *green*, and is thus rendered insensible to *red*, then the eye perceives blackness, not because the accidental red and the accidental green compose blackness, but because the eye has been in succession rendered insensible to two colours which compose white light itself.[5]

3. From experiments on ocular spectra, it would appear that an impression on the one retina can be conveyed to the other. Sir Isaac Newton, having been asked by Locke his opinion respecting a fact relating to this subject stated in Boyle's experiments, communicated to his friend the following observations made by himself.

"The observation you mention in Mr. Boyle's book of Colours, I once made upon myself, with the hazard of my eyes. The manner was this: I looked a very little while upon the sun in the looking-glass with my right eye, and then turned my eyes into a dark corner of my chamber, and winked, to observe the impression made, and the circles of colours which encompassed it, and how they decayed by degrees, and at last vanished. This I repeated a second and a third time. At the third time, when the phantasm of light and colours about it were almost vanished, intending my fancy upon them to see their last appearance, I found, to my amazement, that they began to return, and, by little and little, to become as lively and vivid as when I had newly looked upon the sun. But when I ceased to intend my fancy upon them, they vanished again. After this, I found that, as often as I went into the dark, and intended my mind upon them, as when a man looks earnestly to see anything which is difficult to be seen, I could make the phantasm return without looking more upon the sun; and the oftener I made it return, the more easily I could make it return again. And at length, by repeating this without looking any more upon the sun, I made such an impression on my eye, that if I looked upon the clouds, or a book, or any bright object, I saw upon it a round bright spot of light, like the sun; and, which is still stranger, though I looked upon the sun with my right eye only, and not with my left, yet my fancy began to make an impression upon my left eye as well as upon my right. For if I shut my right eye, or looked upon a book or the clouds with my left eye, I could see the spectrum of the sun almost as plain as with my right eye, if I did but intend my fancy a little while upon it; but by repeating, this appeared every time more easily. And now, in a few hours' time, I had brought my eyes to such a pass, that I could look upon no bright object, with either eye, but I saw the sun before me, so that I durst neither write nor read; but, to recover the use of my eyes, shut myself up in my chamber, made dark, for three days together, and used all means to divert my imagination from the sun. For if I thought upon him, I presently saw his picture, though I was in the dark. But, by keeping in the dark, and employing my mind about other things, I began, in three or four days, to have some use of my eyes again; and, by forbearing to look upon bright objects, recovered them pretty well; though not so well but that, for some months after, the spectrum of the sun began to return as often as I began to meditate upon the phenomena, even though I lay in bed at midnight with my curtains down. But now I have been very well for many years; though I am apt to think, if I durst venture my eyes, I could still make the phantasm return by the power of my fancy."[6]

It deserves to be remarked, that the fact of the transmission of the ocular spectrum of the sun from the retina of the one eye to that of the other, was observed and described by Sir David Brewster[7], long before the letter of Newton, of which the above is an extract, was given to the world.

4. The ocular spectra which are produced by looking at the sun are not only apt to continue for hours, days, or weeks, but are often followed by serious affections of the retina.

Buffon tells[8] us, that one of his friends having one day looked at an eclipse of the sun through a small hole, observed for more than three weeks a coloured image of that body upon all objects. When he fixed his eyes upon a brilliant yellow, as that of a gilt frame, he saw a purple spot; when on blue, as that of a slated roof, a green spot.

Sir David Brewster found, after his experiments, that his eyes were reduced to such a state of extreme debility, that they were unfit for any farther trials. A spectrum of a darkish hue floated before his left eye for many hours, succeeded by the most excruciating pains, shooting through every part of the head. These pains, accompanied with a slight inflammation in both eyes, lasted for several days. Two years after, the debility of the eyes still continued, and several parts of the retina in both eyes had completely lost their sensibility.[9]

The case recorded by Boyle, which gave rise to Newton's letter to Locke, was that of an eminent scholar, who, from looking at the sun through a telescope, without any coloured glass to take off the splendour of the object, brought on such an ocular spectrum, that nine or ten years afterwards he still saw, on turning towards a window, or any white object, a globe of light, of about the bigness with which the sun originally appeared to him.

5. There must at all times, and from every object, be a tendency to the production of ocular spectra; but partly from habitual inattention to them, partly from their being lost in the overwhelming effect of direct impressions, and effaced from the retina in the intervals of repose, they are seldom made the subject of complaint, except by those whose eyes are peculiarly sensible, or have become greatly weakened by over-fatigue and other causes.[10] In such persons a combination of photopsia, muscæ volitantes, and ocular spectra is not uncommon. I knew a person, who had by night-study induced muscæ volitantes, and who was considerably troubled during the early hours of rest with photopsia, and in the morning with reverse spectra of the objects in his dressing-room, such as a black chair, which appeared in white whenever he turned his eyes to the walls of the room, or a framed print, the spectrum of which appeared black with a white edge, the result of a dark frame and whitish print.

"All persons," says Müller, "are not equally susceptible of the phenomena of the coloured spectra. Some individuals perceive them with difficulty, others without any trouble. When once seen, the observation is repeated with extreme ease. Most persons are little acquainted with the ocular spectra, owing to their attention not having been directed to them. When, however, they, and the laws of their production, are known, their constant presence frequently becomes tormenting."

Looking through blue or green glasses is necessarily productive of ocular spectra. The moment blue glasses are laid aside, all light coloured objects appear of an orange hue; if the glasses are green, on removing them everything is seen of a red colour, the complementary colour of green. When the eyes are so weak as to require to be shaded by coloured glasses, those of a neutral or smoky tint, are generally to be preferred. The Chinese, Mr. White Cooper informs us[11], have shown wisdom, in using from time immemorial, for checking the glare of the sun, a transparent substance, which, from the resemblance of its hue to that of a weak infusion of black tea, is called *tea-stone.*

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[1] Boyle's Experiments and Considerations touching Colours, p. 16; London, 1670.

[2] Buffon sur les Couleurs Accidentelles, Mémoires de l'Académie Royale des Sciences, année 1743, p. 147; Paris, 1746.

[3] Elements of Physiology, translated by Baly; Vol. ii. p. 1180; London, 1842.

[4] De la Hire sur les differens Accidens de la Vue, Mémoires de l'Académie Royale des Sciences, année 1694; Tome ix. p. 614; Paris, 1730: Jurin's Essay on Distinct and Indistinct Vision, at the end of Smith's Optics: Porterfield on the Eye; Vol. i. p. 343: Æpinus, Novi Commentarii Petropolitani; Tom. x. p. 283; Petropoli, 1766: Scherffer sur les Couleurs Accidentelles, Rozier's Observations sur la Physique; Tom. xxvi. pp. 175, 273, 291; Paris, 1785: Darwin, Philosophical Transactions; Vol. lxxvi. p. 313; London, 1786: Article, *Accidental Colours,* in the Edinburgh Encyclopædia: Plateau, Mémoires de l'Académie Royale des Sciences de Bruxelles; Tome viii; Bruxelles, 1834: Ibid., Philosophical Magazine, May, 1839, pp. 330, 439: Brewster, Ibid., December, 1839, p. 435: Fechner, Poggendorff's Annalen; Band xliv. pp. 221, 513: Band l. pp. 193, 427; Leipzig, 1838, 1840.

[5] Brewster, Edinburgh Review, April, 1834, p. 161.

[6] Locke's Life, by Lord King; Vol. i. p. 405; London, 1830.

[7] Article, *Accidental Colours,* in the Edinburgh Encyclopædia.

[8] Op. cit. p. 155.

[9] Article, *Accidental Colours,* in the Edinburgh Encyclopædia.

[10] Galenus de Symptomatum Causis; Lib. i. cap. 2.

[11] On Near Sight, &c., p. 190; London, 1853.

SECTION VIII. — INSENSIBILITY TO CERTAIN COLOURS.

Syn. — Dyschromatopsia, from δυς, *with difficulty,* χρῶμα, *colour,* and ὄψσις, *vision.* Colour-blindness, *Brewster.* Mangel an Farbensinn, *Ger.*

Numerous instances are recorded of persons, who were liable to strange mistakes regarding the colours of objects, or were even totally unable to perceive certain colours. Some of the individuals in question appear to have been myopic, but the eyes of most of those who presented this defect are described as appearing in no way diseased or abnormal, and to have fulfilled their functions perfectly, so far as communicating ideas of the form, size, and distance of objects, from a cognizance of light and shade, was concerned.

Mr. Huddart mentions the case of one Harris, a shoemaker at Maryport in Cumberland, who could distinguish only black and white, and who had two brothers almost equally defective, one of whom always mistook orange for green. Harris observed this defect when he was four years old. Having by accident found in the street a child's stocking, he carried it to a neighbouring house to inquire for the owner: he observed the people call it a *red* stocking, though he did not understand why they gave it that denomination, as he himself thought it completely described by being called a *stocking*. The circumstance, however, remained in his memory, and, together with subsequent observations, led him to the knowledge of his defect. He observed, for instance, that other children could discern cherries on a tree by some pretended difference of colour, though he could distinguish them from the leaves by their difference only in size and shape.[1]

Another case of a Mr. Scott is recorded, to whom full reds and full greens appeared alike, while yellows and dark blues were very easily distinguished. Mr. Scott's father, his maternal uncle, one of his sisters, and her two sons, had all the same imperfection.[2]

Dalton, the celebrated chemist, could not distinguish pink from blue, by daylight; and in the solar spectrum, the red was scarcely visible to him, the rest of it appearing to consist of two colours, yellow and blue. He appears to have remained long unconscious of his defect; and was led, rather to suppose that there existed some perplexity in the nomenclature of colours, than any incapability in his own power of distinguishing them.[3]

Those who feel inclined to examine the particulars of other instances of this sort, may consult the works referred to in the note.[4] They will find, on doing so, that the chief peculiarities of these cases are, the confounding of red with green, and pink with blue; in other words, that red light, colours in which red forms an ingredient, and its accidental colour, green, are not distinguishable by those who labour under the defect in question. Red appears to them merely a *dark colour*, and green a *shade of drab*. They judge of orange, purple, and brown, with great difficulty. The only colours they can truly distinguish are yellow and blue, which appear to them entire opposites, as much so as black and white. Blue is by many imperfectly distinguished from red. In all, the perception of yellow is the most perfect. By gas-light or candle-light, the distinction between red and green, which is so slight by day-light, becomes in many cases quite apparent. Examined very carefully by Sir John Herschel, Mr. Troughton was found capable of fully appreciating only blue and yellow tints, and these names uniformly corresponded in his nomenclature to the more or less refrangible rays generally; all belonging to the former indifferently exciting a sense of blueness, and the latter of yellowness[5] Mention has been made of individuals seeing well in other respects, but devoid altogether of the sense of colour, distinguishing different tints only as brighter or darker than another; but such a case is, probably, one of extremely rare occurrence.

At. Dr. Nicholl's suggestion, one patient made the curious observation, that on fatiguing his sight, at different times, with gazing upon spots of red and green, laid on a white ground, the eyes became painfully affected, but no accidental colour made its appearance.

We should scarcely suppose, that a deficiency in the perception of colours could be attended with any advantage; yet in one respect, this appears to be the case. In a case recorded by Turberville, the patient could read in a very obscure light.[6] "I see objects," says one of the subjects of this defect, "at a greater distance and more distinctly in the dark than any one I recollect to have met with; this I discovered many years before I was aware of my defective error in colours."[7] Another makes the following observation on the same point. "All objects whatever, when viewed at a distance, lose their local colouring, and assume more or less of a pale or azure blue tinge, which painters term the colour of the air, which is interposed between the spectator and the distant object. No colour contrasts to me so forcibly with black as this azure blue, and as you know that the shadows of all objects are composed of black, the forms of objects which have acquired more or less of this blue hue, from being distant, become defined, and marked by the possession of shadows, which are invisible to me in the high-coloured objects in a fore-ground, and which are thus left comparatively confused and shapeless masses of colour. So much is this the case with me, when viewing a distant object, as to overcome the effect of perspective, and the shading in the form, and the garments of human beings at some distance from my eye, is often so predominant, and marks them so distinctly, as to overcome the effect of diminution of size; and although I see the object most distinctly, I am unable to tell whether it be a child near me, or a grown-up person at a considerable distance."[8] A colour-blind engraver, who reports his case to Dr. Wilson, states that his defective vision is, to a certain extent, useful and valuable. "When I look at a picture," says he, "I see it only in white and black, or light and shade; and any want of harmony in the colouring of a picture is immediately made manifest by a corresponding discord in the arrangement of its light and shade, or, as artists term it, the *effect*. I find, at times, many of my brother-engravers in doubt how to translate certain colours of pictures, which to me are matters of decided certainty and ease."[9]

A counter-view of colour-blindness of great importance, pointed out by Dr. Wilson, refers to the use of coloured signals on railways, or at sea. As a separation of a few yards, or even a few feet, abolishes their sense of distinction between red and green, danger-signals of these colours must prove useless to the colour-blind[10], the number of whom is much greater than is generally supposed. Dalton had been informed of nearly twenty persons with vision like his own; and out of twenty-five pupils he once had, to whom he explained the subject, two were found colour-blind, and on another similar occasion, one. Among every twenty men, assembled by chance, Prevost reckoned upon one being colour-blind.[11]

That portion of Dr. Wilson's paper, which takes up the extent to which colour-blindness prevails, has not appeared when I am obliged to send this section to press; but I have been favoured by that gentleman with the following statement:—

"As for colour-blind statistics, I certainly disbelieve Prevost's numbers, if intended to apply to cases such as Dalton's. If, on the other hand, he included every degree of confusion or uncertainty about colours, and in particular that regarding blue and green, his numbers may be just; but it would be easy to show that blindness, deafness, and lameness are as common.

"My own conclusions, as gathered from the examination of 1154 persons in Edinburgh, are, in reference to the three kinds of confusion, as follows:—

Confounded red with green - - -	1 in 55
Confounded brown with green - - -	1 in 60.
Confounded blue with green - - -	1 in 46.

"The first two are degrees of the same affection : all in the first category must be added to those in the second, and many of those in the second might appear in the first; but no one was counted more than once. The blue and green forced themselves upon notice, and were not specially looked for."

Colour-blindness has been detected much oftener in males than in females. It runs in families; but when thus entailed, it sometimes overleaps one generation or more. It is propagated more frequently by female than by male descendants. Amongst the many cases now recorded, I do not recollect that it has ever been found to affect only one eye.

There are no objective signs of colour-blindness, sufficiently constant to be relied upon. The iris is frequently light-blue, interspersed with yellow spots near the edge of the pupil; and a depression above the middle of the eyebrow, indicating, according to the phrenologists, a defective organ of colour, is observed in many, although not in all instances.

I considered this affection as always a congenital one, till I was consulted by a man who had gradually become subject to it. He was by trade an ornamental painter, and could judge at one time perfectly of colours. His right eye was affected with mydriasis when he called upon me, and there was incomplete amaurosis of both eyes, so that he could no longer read a common type. On trying him, I found he mistook red and green. The use of spirits and tobacco was probably the exciting cause of the affection of sight in this individual. Concussion of the brain[12], and other causes of cerebral disease, have been known to give rise to colour-blindness, temporarily or permanently.[13] Congenital cases appear to undergo no change, either for the better or worse, in the course of life. Originating from diseased brain, a cure has been effected. Esquirol mentions the case of a lady, aged sixty-eight, to whom, under an attack of cerebral congestion, which lasted about one hour, everything appeared to be black, even the persons who addressed her, and whose voices she recognised. The attack was immediately removed by applying leeches to the neck.[14] In Mary Bishop, whose case is recorded by Dr. Hays, blood-letting and purging, relieved the symptoms of cerebral congestion, and restored the power of distinguishing colours.[15]

Causes. The following are some of the notions which have been formed regarding the efficient cause of insensibility to colours.

1. Dalton thought it probable that the red light is, in these cases, absorbed by the vitreous humour, which he supposed might have a blue colour; a very unlikely conjecture at the best, but which appears to be refuted by the simple experiment of looking through a pair of green or blue glasses. When we do so, we still recognise every primitive colour in bodies, with a shade merely of green or blue over it. Therefore, supposing the rays of light to pass through a blue vitreous humour, it does not follow that objects should appear blue, or that we should be prevented from discerning red light, or any other colour. In old age, we view all objects through an amber-coloured crystalline, and yet see everything of its natural hue.

2. On the supposition that the choroid coat is essential to vision, it has been hinted, that the loss of red light in the subjects of this defect, might arise from the retina itself having a blue tint, so that the light, falling upon the choroid coat, being deprived of its red rays by the absorptive power of the blue retina, the impression conveyed back to the retina by the choroid, would not contain that of red light.[16] In obedience to the directions of Dalton, an examination of his eyes were made, after death, by Mr. Ransome. The crystalline lens was amber-coloured, as usual in old persons; but no blue vitreous humour nor blue retina was there, thus affording a refutation of both these conjectures.[17]

3. Dr. Young, adopting apparently the notion of Darwin, that the retina is active not passive in vision, regards it as the simplest explanation of this defect, to suppose that those fibres of the retina, which are calculated to perceive red, are absent or paralysed.[18]

4. Sir David Brewster conceives that the eye, in these cases, is insensible to the colours at one end of the spectrum, just as the ear of certain persons has been proved, by Dr. Wollaston, to be insensible to sounds at one extremity of the scale of musical notes, while it is perfectly sensible to all other sounds.[19] Dr. Wilson observes, however, that blindness to red is the obverse of deafness to shrill sounds. "According to the undulatory theory," says he, "the wave of red light is slower in its vibrations than the other coloured waves. It thus corresponds to the slower undulations of sound, which produce low tones. Blindness to red is, therefore, analogous to deafness to *grave,* not acute sounds."[20]

5. The followers of Gall and Spurzheim maintain, that the faculty of distinguishing colours does not depend on the eye, but on a particular part of the brain, to which they give the name of the *organ of colour;* and that in those who are deficient in judging of colours, the defect lies in this organ, and not in the eyes, the mechanical construction and optical effects of which appear to be perfect in the individuals in question. This view of the matter appears also to be adopted by Sir John Herschel. "We have examined, with some attention," says he, "a very eminent optician, whose eyes (or rather eye, having lost the sight of one by an accident) have this curious peculiarity, and have satisfied ourselves, contrary to the received opinion, that all the prismatic rays have the power of exciting and affecting them with the sensation of light, and producing distinct vision, so that the defect arises from no insensibility of the retina to rays of any particular refrangibility, nor to any colouring matter in the humours of the eye preventing certain rays from reaching the retina (as has been ingeniously supposed), but from a defect in the sensorium, by which it is rendered incapable of appreciating exactly those differences between rays on which their colour depends."[21]

In those affected with colour-blindness, as well as in those defective in perceiving the harmony of colours, the phrenologists find a depression immediately above the middle of the eyebrow, indicative, they suppose, of want of development in a particular convolution of the cerebrum, in which they place the organ of colour. They tell us, that the smallness of this organ is remarkable in the bust of

Dalton, modelled by Cardwell; and Mr. Ransome, who is no phrenologist, states, as a fact noticed in the dissection of Dalton, "that there was a marked deficiency in the convolutions of the brain over the orbitar plates, which are assigned to the organ of colour."[22]

On whatever cause an insensibility (partial or complete) to colour depends, it is a state of vision for which there appears to be no means of cure. Two facts, however, noticed by the elder Seebeck[23], have led to the suggestion of a palliative remedy. The facts in question were that colour-blind persons were able with artificial light, to pronounce certain colours to be unlike, which they confounded when regarded with the naked eye in daylight; and that the same happened when they looked through certain coloured glasses. It does not appear what were the colours of the glasses used by Seebeck; but Wartmann speaks of the surprising effect produced by making a colour-blind person look through a red medium in order to distinguish red and green. I had considerable doubts as to this point; and on applying to Dr. Wilson, I was informed by him, that he had found red and green glasses give no help to the colour-blind, in distinguishing between the red and green objects which with unassisted vision they were liable to confound. It was otherwise with yellow glasses, which Dr. W. found markedly to assist a certain class of colour-blind persons. As artificial light differs from daylight, mainly, as is believed, by an excess of yellow rays, it struck him that if parties who were able to distinguish red and green by yellow candle or gas-light, were to use yellow glasses in daylight, they might thereby reduce the light of the sun to the quality of candle-light, and see by the former, as they did by the latter. Accordingly, Dr. W. distributed, among his more accessible colour-blind friends, yellow or rather pale orange glasses. Several got no good from them, and all complained of the loss of light; but two parties found themselves able to make the same distinction between red and green by daylight, as, without such glasses, they made by gas or candlelight. Some time after making these trials, and publicly advising the use of yellow glasses, as a palliative for colour-blindness, Dr. W. found, that Sir David Brewster[24] had previously recommended them as best fitted, in many cases of imperfect vision, to excite a torpid retina, on the ground that this membrane receives a more powerful luminous impression from yellow light than from the pure white light, of which the yellow forms a part. It seems probable, however, that yellow glasses will prove of use to colour-blind persons, not so much because yellow light has the power of exciting the retina to a general increased sensitiveness, as because, acting chromatically, it reduces the quality of daylight to that of artificial light, and communicates to bodies those tints to which colour-blind eyes respond the best.

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[1] Philosophical Transactions ; Vol. lxvii. p. 260 ; London, 1777.

[2] Ibid.; Vol. lxviii. p. 611; London. 1779.

[3] Memoirs of the Literary and Philosophical Society of Manchester ; 1st Series, Vol. v. p. 28 ; Manchester, 1798.

[4] Nicholl, Medico-Chirurgical Transactions; Vol. vii. p. 477 ; Vol. ix. p. 359 : and Annals of Philosophy; New Series, Vol. iii. p. 128 : Butter, Transactions of the Phrenological Society, p. 209 : Combe, Ibid., p. 222 : Harvey, Transactions of the Royal Society of Edinburgh, Vol. x. p. 253; and Edinburgh Journal of Science, Vol. v. p. 114 : Brewster, Edinburgh Journal of Science, Vol. iv. p. 85 : Phrenological Jour-

nal, Vol. iii. p. 265 ; and Vol. vii. p. 152 : Colquhoun, Glasgow Medical Journal ; Vol. ii. p. 12 : Gräfe und Walther's Journal der Chirurgie und Augenheilkunde ; Band v. p. 19 ; Berlin, 1825 : Earle, American Journal of the Medical Sciences, April, 1845, p. 346 : D'Hombres-Firmas, Comptes Rendus des Séances de l'Académie des Sciences, 13 Août, 1849, p. 175.

[5] Article *Light*, in Encyclopædia Metropolitana, p. 435, § 507.

[6] Philosophical Transactions, No. 164 ; or Lowthorp's Abridgment ; Vol. iii. Part i. p. 40.

[7] Medico-Chirurgical Transactions ; Vol. ix. p. 361 ; London, 1818.

[8] Glasgow Medical Journal ; Vol. ii. p. 14 ; Glasgow, 1829.

[9] Monthly Journal of Medical Science, December, 1853, p. 494.

[10] Ibid., November, 1853, p. 392.

[11] Wartmann, Mémoires de la Société de Physique et d'Histoire Naturelle de Genève ; Tome xii. p. 196 ; Genève, 1849.

[12] Taylor's Scientific Memoirs ; Vol. iv. p. 185 ; London, 1846.

[13] Wilson, Op. cit., December, p. 506.

[14] Des Maladies Mentales ; Tome ii. p. 26 ; Paris, 1838.

[15] American Journal of the Medical Sciences, August, 1840, p. 277.

[16] Edinburgh Journal of Science ; Vol. iv. p. 86.

[17] London Medical Gazette, March 21, 1845, p. 810.

[18] Lectures on Natural Philosophy ; Vol. ii. 315 ; London, 1807.

[19] Edinburgh Journal of Science ; Vol. iv. p. 86 : Philosophical Magazine, August, 1844, p. 134.

[20] Op. cit., April, 1854, p. 315.

[21] Op. cit., p. 434, § 507.

[22] Phrenological Journal ; Vol. xix. p. 252 ; Edinburgh, 1846.

[23] Poggendorff's Annalen ; Band xlii. pp. 216, 218 ; Leipzig, 1837.

[24] Philosophical Magazine, August, 1844, p. 139.

SECTION IX. — MYODESOPIA.

Syn.—Myodesopia, from μυῖα, *a fly*, εἶδος, *form*, and ὤψ, *appearance* or *sight*. Visus muscarum. Visio phantasmatum. Muscæ volitantes Mouches volantes ; Imaginations perpétuelles, *Fr.* Die Flecken vor den Augen ; Das Flockensehen ; Das Mückensehen, *Ger.*

Fig. Demours, Pl. 65. Weller, Tab. V.

The vision of objects on the surface or in the interior of the eye has attracted attention, chiefly in relation to a symptom, to which the name of *muscæ volitantes* has been given. Any spectrum, or visual appearance, which is apt to impose on the patient, and lead him to think that flies are moving before him, is called a *musca volitans ;* and that whether it results from an impression on the retina produced by an object on or in the eye, or from a loss of sensibility in that membrane. The seeing of muscæ volitantes has received the name of *myodesopia ;* an affection which, although in some instances the result of a mere want of sensibility in certain parts of the retina, arises oftener from the actual perception of objects on or in the eye. Hence the distinction of *myodesopia sensitiva* and *insensitiva.*

In general, it is only when the perception of the different kinds of spectra of which the eye is susceptible becomes exaggerated, that the disease called myodesopia can be said to exist. By simple methods, which I have elsewhere[1] fully described, the various spectra, which produce sensitive myodesopia, may all of them be perceived and examined by the normal eye, as well as certain spectra, which are at least analogous to the imitations of sensations constituting the insensitive variety of the disease.

Myodesopia sensitiva comprehends those sensations which arise from, 1. The layer of mucus and tears on the surface of the cornea. 2. Corpuscles between the external surface of the cornea and the focal centre of the eye. 3. Corpuscles between the focal centre of the eye and the sensitive layer of the retina.

Myodesopia insensitiva arises from certain diseased conditions of 1. The retina. 2. The choroid.

I. MYODESOPIA SENSITIVA.

§ 1. *Muco-lacrymal Muscæ Volitantes.*

Vision of the layer of mucus and tears on the surface of the cornea.—If a normal or a presbyopic eye be directed through a pretty deep concave lens, as one of 2½ inches' focus, or what is called No. 12, toward the flame of a candle placed at the distance of about 20 feet, a circular luminous figure appears, dotted all over with minute round spots, and bounded by a finely indented edge. The edge is that of the pupil greatly magnified; and the spots are images of the candle multiplied by the layer of fluid lying on the surface of the cornea, and which consists of globules. The spectrum is inverted in this way of viewing it; the globules at the upper part of the cornea being seen below, and *vice versâ*. They are seen to run together occasionally, so as to form larger spots; and then to separate, as we wink, into smaller ones. On closing the eye, the upper eyelid, with its cilia, is seen as if rising from the lower part of the field of view; and the globules, after each act of nictitation, appear as if they floated down over the cornea. The fluid which gives rise to this appearance is a mixture of tears with the mucous secretion of the conjunctiva, lying on the surface of the cornea in the form of minute drops, and exercising the function of preserving that surface in a moist and transparent state, fit for the easy transmission of the rays of light. Invisible, in general, to the naked eye, it is, in this simple experiment, rendered visible, by directing through it a small pencil of divergent light, each globule acting on the light which falls upon it, so as to converge it sufficiently, along with the refraction of the transparent media of the eye, to bring it to a focus on the retina.

Muco-lacrymal spectrum seen in the field of the microscope and telescope.—In hanging the head over the microscope, especially if one is affected with catarrh at the time, the globules, by gravitating to the centre of the cornea, not unfrequently appear to the observer so as to impede his view of the object, till by the act of nictitation he clears them away. In telescopic observations, also, the muco-lacrymal spectrum is apt to prove a source of annoyance. Thus, in looking at the sun through a tinted glass, the observer may be unable to distinguish the spots on that body, being perplexed by what seems the reflection of some part of his own eye interspersed between it and the sun. This is caused by the layer of mucus and tears on the surface of the cornea.

Muco-lacrymal muscæ volitantes.—As a very rare occurrence, I may state the following instance of the muco-lacrymal spectrum giving rise to the sensation of muscæ volitantes.

Case 866.—I was consulted by a very short-sighted person, occasionally troubled with the appearance of numerous opaque round spots before one of his eyes; each spot being surrounded by a halo. Sometimes several of them appeared to run together into dots, which again divided and disappeared. He noticed that they ascended after every act of nictitation. From the patient's description, and the figure he sent me of what he saw, I had no doubt that the sensation of which he complained arose merely from the globules on the surface of the cornea.

§ 2. *Muscæ volitantes depending on corpuscles between the external surface of the cornea and the focal centre of the eye.*

Want of accurate observations of the spectra produced by corpuscles in this situation —Methods of detecting and distinguishing such spectra.—I know of no accurate observations of spectra depending on corpuscles floating in the aqueous humour.

Depositions in the cornea, or in the crystalline, are readily perceived on looking through a hole in a blackened card made with the point of a needle. Even a fissure in the crystalline, running in the direction of the radii formed by its fibres, may, if I mistake not, be discerned in this way. Opacities of the cornea, or the crystalline, may also be seen by the same means which enable us to see the globules of mucus on the cornea. They are to be distinguished from these by their occupying an immediately posterior plane in the field of view; by the double images formed of them by exposing the eye to two divergent beams of light, being less separated from one another than the double images of the muco-lacrymal spectrum; and by their not suffering the same changes from the act of nictitation. From corpuscles residing in the vitreous humour they will be distinguished by their occupying an anterior plane in the field of view; by their double images being more widely separated; and by the possibility of readily inverting their spectrum by the same means by which we invert that of the globules on the cornea. All objects anterior to the focal centre of the eye are seen inverted on looking through a double concave lens, as above directed. To see them in their natural position, it is sufficient to view a candle at 20 feet distance, or a street lamp at 60 feet distance, through a double convex lens of 1½ inch focus placed close before the eye. If we carry such a lens forward from the eye, so that the cornea is no longer within the focal distance of the lens, all objects on or in the cornea, in the aqueous humour or in the crystalline, are instantly inverted.

Depositions in the cornea, aqueous humour, or crystalline, never produce, as far as I know, the sensation of muscæ volitantes. The effect of specks of the cornea and partial opacities of the crystalline or its capsule, is merely to produce indistinctness of vision; exactly as when we place a pin close in front of the cornea. Closing one eye, and holding a pin at such a distance before the other eye as to see it most distinctly, if we gradually bring the pin towards the eye, it becomes less and less distinct, and, at last, when so close as to touch the eyelashes, it disappears; the whole effect of its presence being to throw a shadow over the entire retina, and thus cause a mistiness in our perception of surrounding objects, so slight, however, as not even to prevent our reading a printed book placed at the ordinary distance. If we now take a card perforated with a pinhole, and bring it between the eye and the pin, we find that through the pinhole we see the pin distinctly. By the same contrivance, which is equivalent simply to limiting the breadth of the luminous pencil admitted to the retina, any corpuscle or deposition on or within the eye becomes visible; although in naked vision its impression may be imperceptible.

Under ordinary circumstances, then, corpuscles or depositions anterior to the focal centre of the eye, which is generally regarded as close behind the crystalline, will not be visible to the person in whose eye they exist; and, if few and minute, will have little effect on the distinctness of vision. They may perhaps be visible to an eye exceedingly myopic, and, to the scientific observer may sometimes prove a still more serious evil than the globules on the cornea, as their shadow, perceptible on looking through a microscope or telescope of high power, cannot be got quit of, like the muco-lacrymal spectrum, by mere nictitation.

§ 3. *Muscæ volitantes depending on corpuscles between the focal centre of the eye and the sensitive layer of the retina—Entohyaloid muscæ—Floating muscæ.*

Four different entohyaloid spectra—Methods of viewing them—Relative position of the corpuscles which produce them.—If one looks at the flame of a candle two or three feet distant, or at the sky, through a hole made in a blackened card with the point of a fine needle, or through a convergent lens of short focus, such as the eye-glass of a compound microscope, on steadily regarding the luminous field presented to view, four sets of spectra will be seen (Plate II. *fig.* 3), independent of the muco-lacrymal spectrum. The most remarkable appears nearest to the eye, and consists of twisted strings of minute pearly globules, hung across the field of view (Plate II. *fig.* 3 *a.*). The second in point of remarkableness, and the farthest of the four from the eye, consists of watery-like threads, destitute of any globular appearance, and depending chiefly from the upper part of the field (Plate II. *fig.* 3 *b.*). I call the former the *pearly spectrum*, and the latter the *watery spectrum.* In two distinct planes, between those occupied by these two spectra, float two sets of globules, not aggregated into threads, but insulated. These constitute what I call the *insulo-globular spectra.* The individual globules of the set further from the eye, being hazy and ill-defined, may be compared in appearance to small grains of sago (Plate II. *fig.* 3 *c.*). The globules of the set nearer to the eye are clear in their centre, exteriorly to which they present a sharp black ring, and still more exteriorly a lucid circumference (Plate II. *fig.* 3 *d.*). These four sets of spectra never mingle with one another, so as to change the order in which they stand before the eye; but the pearly spectrum always appears the nearest; then the sharply defined insulo-globular; then the obscurely defined globules; and farthest away the watery threads.

Method of procuring double images of corpuscles situated in front of the retina.—The following experiment we owe to Sir David Brewster[2], who has by its means thrown more light on the subject of muscæ volitantes than all preceding writers.

Place two candles before the eye, at the distance of a few inches from each other. Look at them through a pin-hole, or through a double convex lens, so as to make the two luminous fields to overlap. In the middle space formed by the overlapping of the two fields, double images will be seen of all the perceptible objects on the eye, or within it, and in front of the sentient layer of the retina; and amongst these, double images of the muco-lacrymal globules, the watery spectrum, the insulo-globular spectra, and the pearly spectrum. If the candles are placed about ten feet from the eye, and viewed through a convergent lens of 1½ inch focus, the double images of the muco-lacrymal globules will be seen widely apart from one another; those of the threads of the watery spectrum less widely; less widely still those of the obscure insulo-globular spectrum, and of the sharply defined one; while the double images of the pearly spectrum are quite close to one another, showing the relative position of the causes of these spectra in the eye, viz. the muco-lacrymal substance on the surface of the cornea, and the corpuscles causing the pearly spectrum close to the sentient layer of the retina; while the causes of the watery and insulo-globular spectra occupy the middle space.

Appearances of the watery spectrum.—The depending threads of which the watery spectrum consists have somewhat of a rounded appearance, differing in this respect from the pearly, the threads of which seem flat. Each of the watery threads is bounded by two dark lines, within which there is a broad space, which is clear, and destitute of anything like globules. These watery threads measure fully twice the diameter of the threads of the pearly spectrum. They are not all in one plane. Their general course is vertical and gently flexuous. They often divide at their lower extremity into two or more branches, which seem to melt away insensibly. They have so much the appearance which we might suppose streams of tears to have as they descend from the lacrymal ducts and flow over the cornea, that I at one time thought this was their real nature, till I discovered that they exist in a plane or planes posterior to the muco-lacrymal spectrum, and posterior to any deposition on the anterior surface of the crystalline. At first view they seem to slide down slowly from the upper to the middle part of the field of view; but they possess neither the extent nor the quickness of motion of the pearly spectrum. They are rarely observed at the lower part of the field of view, and must exist, therefore, being seen inverted, chiefly in the lower portion of the entohyaloid space. Any bending or extending which they undergo in the movements of the eye are slight; and their seeming to be displaced and broken into fragments by nictitation is a deception.

I have called this spectrum the *watery*, merely from its appearance; for I have ascertained neither its exact seat nor its nature. It seems probable that the cause upon which it depends is not far behind the crystalline, if not actually in contact with the posterior capsule.

Muscæ volitantes produced by the watery spectrum.—The watery spectrum becomes, in some cases, so much exaggerated as to give rise to the sensation of muscæ volitantes, most apt to be perceived on first going out in the morning. It is compared by some patients to the appearance of threads of spun glass, laid across each other, or to that of a fine lock of wool. It appears a little above the centre of the field of vision, and of course seems greatly magnified by the distance of the surface against which it is viewed. Although it still retains the form of numerous watery threads, and these never appearing to contain globules, the threads are more irregularly heaped together, and often assume a zig-zag figure. They are also either readily dispersed by one or two forcible acts of nictitation (differing in this respect from the spectrum, as viewed through a pinhole or the eyeglass of a compound microscope), or by such acts the eye falls into a state in which they are no longer perceptible. The circumstances now noticed are very apt to mislead the patient as to the seat of what he sees, which he probably refers to the surface, and not to the interior of his eye, where the cause actually resides.

Muscæ volitantes produced by the insulo-globular spectra.—The ill-defined globules, which lie immediately behind the watery spectrum, rarely give rise to the sensation of muscæ volitantes; but the globules which occupy the next plane, and whose edges are sharp and dark, frequently appear to the naked eye, either as simple black points or as black rings. Viewed carelessly, or without the aid of any optical contrivance, they often seem to be connected to the outside of the threads constituting the pearly muscæ volitantes.

Appearances of the pearly spectrum.—Almost every eye, even the most healthy, and which has never attracted the possessor's attention by muscæ volitantes, exhibits the pearly spectrum, on being directed towards a luminous field, through a fine pinhole, the eye-glass of a compound microscope, or a convex or concave lens of short focus. I have given it the name of the *pearly spectrum*, from its resemblance to a string of pearls. Prevost[3] had already called it *apparence perlée*, or simply *perles*.

The lines of the pearly spectrum are hung across the field of vision as often transversely as vertically. On first directing the eye towards the luminous field, in one or other of the methods just mentioned, perhaps only a very few small pearly globules are perceived; but after steadily regarding it for a short time, numerous strings of them are discovered, generally twisted in different forms, and presenting a variety of knots, loops, and agglomerations. Sometimes they are so numerous as to form an extensive shower or cloud. The pearly threads are of different lengths; some of them very short, others stretching across the whole field. Not unfrequently some of them end abruptly in a sort of bulb. The globules or pearls forming the threads or rosaries, seem joined together merely by apposition, without being contained in any tube. Sometimes, however, the globules are rather indistinct, and then the threads approach to a tubular appearance. The globules are always in single rows. They appear destitute of any nucleus. They are not all of one diameter, but are all smaller than the globules of the insulo-globular spectra. I have not satisfied myself that all the pearly threads occupy the same plane, although it is very evident that they are behind the insulo-globular spectra.

Apparent and real motions of the pearly spectrum.—That portion of the pearly spectrum which appears in the centre of the field of view has but little real motion, less perhaps than the watery spectrum which is seen beyond it. Both partake, of course, in the motion of the eyeball; and this gives to both a wide apparent motion. But if the field be examined towards its circumference, or if the eye be suddenly rotated upwards, other pearly spectra appear, which it is difficult or impossible for the observer to bring directly before him; and which, when he succeeds in some measure in doing so, quickly subside again out of view, partly by a real motion of their own, partly by a wide apparent motion, owing to their obliquity in respect to the axis of vision. It is these last spectra, chiefly, which produce the pearly muscæ volitantes.

Appearances of the pearly muscæ volitantes.— Those who begin to be troubled with by far the most common kind of muscæ volitantes find their attention attracted by the appearance of one or more dark bodies dancing before them in the air, and leading them to suppose that perhaps a bit of soot is sticking to the eyelashes, or a minute spider suspending itself from the brim of the hat. On trying to brush away the supposed object, they find out the mistake, and that the spectrum which they see depends on something more immediately affecting the organ of vision than they at first imagined.

In other cases the earliest appearance is that of a thin cloud, somewhat like the wing of a fly, or that of semi-opaque threads, like a spider's web. Sometimes the spectrum is so dark as to be compared to a bit of black lace.

On directing the eyes from side to side, the spectrum moves also, and with such seeming swiftness as often to lead the patient to suppose that a gnat or small fly is crossing the field of vision.

In this state the patient often continues for months or years, without taking the trouble to examine the appearance with any degree of attention. Sometimes, indeed, the annular figure of the darkest portion of the muscæ is too striking to escape notice, and patients often designate such by the appellation of *black stars*. If the patient happens to turn his eyes steadily to the clear sky for a minute or two, he often sees what had hitherto appeared like a thin cloud, bit of cobweb, or wing of an insect, resolve itself into a great number of globules, or minute rings, moving as the eye moves, and connected together as if by some invisible film, so that, although they may change in some measure their relative positions, they never separate entirely from one another.

A more careful examination of his muscæ volitantes against the sky, or against the ground covered with snow, probably discloses to the patient a twisted tubular appearance, the tube being bounded by two lines, while the central space is occupied by a chain of obscure spots or globules, not sufficiently large in general to fill the diameter of the tube, so that while he compares the whole spectrum to a twisted snake, he tells us perhaps that the interior of it resembles the withered substance within the cavity of a quill. The globules, however, are not all of one size, for here and there one larger than the rest, and with more of the appearance of being nucleated, fills the tube's diameter, while not unfrequently one or two of the rings of the insulo-globular spectrum is seen as if attached to the outside of the tube. The observer also remarks in some cases, that the tubes seem to end in dark bulbous extremities, as if formed by agglomerations of globules. The dark spots, or *black stars*, which he first saw when he began to be troubled with such sensations, he finds to be caused either by such agglomerations, or by an appearance at certain points, as if the tubes were coiled up or doubled upon themselves. Such dark spots are often so dense, that in a good light they are visible even through the closed eyelids.

If the patient views the muscæ volitantes through the eyeglass of a compound microscope against the flame of a candle, the appearance of a tube containing globules is by no means so striking as when he views them with the naked eye against the sky, so that he sees merely rosaries and showers of globules, and these destitute of nuclei. The appearance of a tube is produced, in fact, by those portions of the rings or globules which touch each other becoming obscure, while the portions by which they do not touch continue more or less distinct. Hence the edges of the tubes do not appear as straight lines, but undulated. Pearly muscæ appear chiefly when the patient looks at the clear sky, a thin light cloud, the ground covered with snow, a white wall, and the like. By twilight, or candle light, he seldom notices them; nor do they appear when he regards a dark object, or is in a place where there is but little light. They annoy him less in dark wintry weather than during summer. He seldom remarks them when he looks at near objects, or when he keeps his eyes still.

Position of the pearly muscæ volitantes — Their apparent motion.— The pearly muscæ are rarely, if ever, in the axis of vision, but generally a considerable number of degrees from it, outwards or inwards, upwards or downwards, but most frequently outwards, or in the direction of the temple, as if their cause lay near the entrance of the optic nerve. The consequence is, that the patient finds it difficult, in proportion to the obliquity of their position, to examine their configuration and apparent structure; for whenever he tries to bring them directly before him, they flit away, so that he sees them only by a side glance. They partake also in the movements of the eye, darting upwards or downwards, or from side to side, as the eye is moved, and justifying by their apparent motions the comparison indicated by the name of *muscæ volitantes.*

Real motion of the pearly muscæ volitantes.—If a musca volitans is not very remote from the axis of vision, it is easy for the patient to keep it fixed for a length of time over any particular spot in the prospect before him, or in the centre of the luminous field presented by a candle, viewed through a convex or concave lens. The pearly muscæ, however, have a motion of their own, excited no doubt by the motion of the eyeball, but still more extensive than their apparent motion, and partly exhibited after the eyeball is at rest. Thus, if from looking before him in a horizontal direction, the patient suddenly raises his eyes towards a point about 30° above the horizon, and fixes them on some object at that height, he observes that the muscæ fly upwards considerably beyond that degree of elevation, and even beyond the field of view, and then come sailing down before him till they disappear below, evidently showing that whatever be the nature or seat of the corpuscles by which such spectra are produced, they are not entirely fixed, but enjoy a certain degree of freedom.

Muscæ volitantes are described by some authors[4] as suddenly darting upwards, and then as suddenly sinking; but they never move, unless set in motion by movement of the eyeball; and although the motion which they perform in consequence of the impetus given them by the movement of the eyeball is rapid, that by which they return to their former place is comparatively slow.

Were the corpuscles which cause the pearly muscæ situated anterior to the focal centre of the eye, their real motion would correspond with the apparent motion of the spectrum or muscæ, that is to say, they would descend within the eye when the muscæ appeared to descend; but if the corpuscles be situated behind the focal centre, the apparent descent of the muscæ must depend on an actual ascent of the corpuscles. Wherever a corpuscle is situated, whether at *a*, or at *a′* (*Fig.* 128), its spectrum will appear as if projected out of the eye in the continued course of a straight line, passing through the corpuscle, and falling perpendicularly on the retina at A. A corpuscle at *b*, anterior to the focal centre of the eye, C, or at *b′*, posterior to that centre, will form its image at B, and produce the sensation of a spectrum out of the eye, in the direction of the line B *b′ b*. If the corpuscle is situated at *a*, and sinks in the eye to *b*, its image will move over the retina from A to B, and its spectrum will appear to the patient to descend from A′ to B.′ But if the corpuscle is situated at *a′*, it will only be by floating upwards from *a′* to *b′* in the vitreous humour that its image will move over the retina from A to B, and its spectrum appear to the patient to descend from A′ to B′.

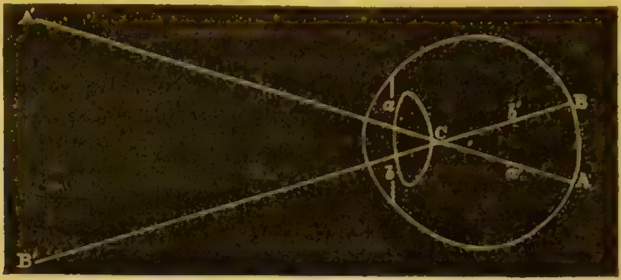

Fig. 128.

If the cause, then, of the pearly muscæ, which always appear to descend when the eye is fixed on any elevated object, resided anywhere anterior to the focal centre of the eye, C, this apparent descent of the muscæ would depend on a real descent of the corpuscles by which they are produced; but if the cause resides posterior to the focal centre, C, the apparent descent of the muscæ must depend on a real ascent of the corpuscles.

Besides the motions of ascent and descent, the pearly muscæ present lateral movements, although less marked, as well as changes in the relative positions of their several parts. If three or four *black stars,* as they are termed, exist in the mesh-like texture which floats before the eye, they will perhaps be observed to lie sometimes in a straight line, and at other times to form an angle with one another, being thrown into different positions in the various movements of the eye. The upper part of the rosariform spectrum will sometimes seem to bend in one direction, and the lower part in the opposite. The threads will appear to uncoil themselves, and then twist themselves into their former shape. A vacillating motion is sometimes observed, as if the web waved backward and forward. All these movements are excited by the motion of the eyeball; but it is easily observed that their extent is greater than that of the motion of the eyeball.

Seat of the efficient causes of the pearly muscæ volitantes.— Many conjectures have been offered regarding the seat of the corpuscles or filaments, which give rise to the pearly muscæ. The surface of the cornea, the aqueous humour, the humour of Morgagni, the vitreous humour, the interval between the hyaloid membrane and the retina, the retina, and the choroid, have each been supposed to be occupied by the efficient cause of this symptom. That the pearly muscæ do not arise from corpuscles, situated on the cornea or in the aqueous humour, is evident from their existing in a plane far behind the corpuscles which produce the muco-lacrymal and watery spectra, from their never mingling with these spectra, from their not being inverted in the experiment which inverts the muco-lacrymal spectrum, and from the closeness of their double images to one another when viewed by means of two divergent beams of light. The fact that double images of the pearly spectrum are always produced in this mode of examining it shows that the cause does not reside in the sentient layer of the retina, or in the choroid.

I shall not pretend to decide that absolutely in no case can floating muscæ depend on the structures of the retina anterior to its sentient layer, and in particular on the ramifications of its blood-vessels, especially since the cause of the pearly spectrum is ascertained to be sometimes no farther from the sentient layer than 1-85th of an inch, which is one of the measurements of Sir David Brewster. That the sentient structure itself is not the part affected is shown by the fact that between the several portions of the muscæ, and by the side of them, the eye sees everything with perfect distinctness; and that even the portions of the retina, over which the shadows which cause the appearances of the muscæ fall, are found by the patient, when the corpuscles ascend out of the field of vision, to be perfectly sensible.

Size of the elementary filament of the pearly spectrum — Its distance from the retina.—Every spectrum appears larger in proportion as the ground upon which it is viewed is more remote from the eye; while its angular magnitude, of course, continues the same. The size of the convoluted or agglomerated muscæ is quite indefinite. Sir David Brewster informs me, that a musca which he sees "would cover the moon; for it consists of a knot of filaments." But it is an interesting question,—What is the size of the elementary or single filament of the pearly spectrum, or of the globules by the concatenation of which the pearly thread is formed? Sir David, by looking through a very minute aperture at two bright sources of light, obtains, by two divergent beams, double images on the retina of all objects placed within the eyeball; and by this means determines the diameter of the musca or its filaments, and its distance from the retina. "The filaments or muscæ in the anterior part of the vitreous humour," he says, "will have their double images very distinct: those in the middle of it will have their double images much nearer: those near the retina will have their two images close, or perhaps overlapping each other; while any object on the retina itself, any black spot arising from defective sensibility, will have only one image, as it were. Now, if we measure the distance of the two sources of light from each other, and also their distance from the centre of visible direction, when the two images of the filaments, &c., are just in contact, we may determine the size of the filament and its exact position, as well as its distance from the retina. In making this experiment, I first found that the angle of apparent magnitude of the shadow of the filament, A, B, C [referring to an elementary filament], was eight minutes, and, consequently, that it subtended this angle at the centre of visible direction. Now, if we take the radius of the retina as 0.524 of an inch, the diameter of the shadow of the filament will be 0.00122, or $\frac{1}{820}$th of an inch, and its distance from the retina, 0.0118, or $\frac{1}{85}$th part of an inch."[5]

On projecting the spectrum of an elementary filament, which I see with my right eye, upon a micrometer, and marking its apparent size, the shadow measured $\frac{1}{600}$ inch; which is not very far from Sir David Brewster's calculation.

What are the filaments and corpuscles in the vitreous humour which cause the watery, insulo-globular, and pearly muscæ?—As by means of proper experiments the pearly spectrum is rendered visible to all eyes, whether young or old (and the same holds, I believe, with respect to the watery and the insulo-globular), the efficient cause, or object seen, can scarcely be the result of disease, however much the being sensible of these spectra, to the extent of what is termed *muscæ volitantes*, must be admitted as the result of some abnormal condition of the eye. As to the question, What are the filaments and corpuscles which are seen? we are left entirely to conjecture; no decisive observations, either in the living or the dead subject, bearing upon it.

Were the whole of the corpuscles or filaments situated close to the retina, as those which cause the pearly spectrum are, we might be inclined perhaps to suppose that they consisted of minute portions of the capillary system of the retina, elevated and disengaged by some chance from their natural situation in the layer of grey fibres, and vacillating between that and the hyaloid. But the succession of planes occupied by the corpuscles and filaments obliges us to renounce the idea of so limited a space for their existence, and to refer them to the interior of the vitreous humour.

"Were they fixed, or regularly distributed," says Sir David Brewster, "we might regard them as transparent vessels which supply the vitreous humour; but, existing as they do in detached and floating portions, they resemble more the remains of some organic structure whose functions are no longer necessary."[6]

This observation tallies remarkably with the fact, that the arteries, generally two in number, springing from the central artery of the retina, and passing through the vitreous body to the posterior capsule of the crystalline, although conveying blood in the fœtus, exist in the adult only in an obliterated or ligamentous state. In the vitreous humour, then, there lie the exuviæ of an *organic structure whose functions have ceased*, consisting of filaments, or contracted blood-vessels, none of them likely to exceed $\frac{1}{500}$ inch in diameter, and most of them probably much smaller. In the fœtus, the exterior surface of the hyaloid membrane is also covered with blood-vessels derived from the central artery of the retina, the persistance of which in the adult otherwise than obliterated must be regarded, I presume, as rare and exceptional.

On the supposition of the slightest mobility of the hyaloid membrane, the diffracted shadow of the last-mentioned obliterated vessels on the retina might afford a plausible explanation of the pearly muscæ; while the insulo-globular and watery might be ascribed to the remains of the capsular arteries.

Microscopic corpuscles exist, as Donné has shown[7], both in the aqueous and vitreous humours in large quantity, measuring between $\frac{1}{4000}$ and $\frac{1}{5000}$ inch in diameter, and of less specific gravity than the fluid in which they are contained. As the appearance of a tube containing globules, in the pearly muscæ, may be entirely the result of diffraction, the whole phenomena of the insulo-globular and pearly spectra may be referred, with considerable probability, to a concatenation of transparent globules attached to the fine laminæ, or filaments, which pervade and give consistence to the vitreous body. As the watery spectrum, viewed either with the naked eye or through a minute aperture, exhibits no appearance of globules, it may be regarded as depending simply on fine transparent filaments.

Action of the filaments and corpuscles which cause muscæ on light.—On account of their perfect identity with the phenomena of the *diffraction* of light produced by transparent fibres, Sir David Brewster ascribes the appearances of the muscæ volitantes we are now considering to shadows formed on the retina by divergent light passing *by* and *through* transparent filaments and particles; a view of the matter which had also occurred to Prevost. When Sir David says "divergent light," he refers to those experiments by which the light falling on the retina is made to diverge from a point within the eyeball. The muscæ are, no doubt, seen very distinctly when we look through a fine aperture, or through a lens, so as to produce divergent light within the eye; but the phenomena of diffraction are visible when the rays of light are convergent, or parallel, as well as divergent; and so are also the pearly muscæ. Indeed, the identity of the phenomena of the pearly muscæ with those of diffraction by fibres is more strikingly displayed when the muscæ are regarded with the naked eye against the sky than in any other way of viewing them. What appears, when seen through a pinhole, as a string of globules, assumes, when viewed against the sky with the naked eye, the semblance of a tube with a central dark line running down the middle of it; the result, no doubt, of the two streams of light which flow round the filament interfering with each other. Sir David Brewster states, that the two lines bounding the filaments which he sees, are coloured, and have, on the outside, one or more coloured fringes; another circumstance referrible to the interference of light.

The sharply defined insulo-globular spectrum is also plainly to be attributed to the diffraction of light by minute spherules; but the obscurely defined insulo-globular and the watery spectra betray much less distinctly alternate rings or stripes, owing, no doubt, to the greater distance at which they are placed from the retina, or screen on which the diffracted shadows are thrown, and which, to display distinctly the phenomena resulting from interference, requires to be at a certain distance from the body whose shadow it receives.

Subjects of the pearly muscæ volitantes.—Speaking of the filaments by which muscæ volitantes are produced, Sir David Brewster observes, that "as they exist in all ages, whether young or old, they are neither the result of disease, nor do they indicate its approach." Certain it is, that the pearly spectrum is recognisable by all eyes, when sought for through a pinhole, or through the eye-glass of a compound microscope.

It is also true, that the same objects which produce pearly spectra are seen by many individuals, who do not make any formal complaint of muscæ volitantes, or ever fancy that they are affected with any disease of their eyes. "I was consulted," says Demours, "not long ago, by a lady, who was firmly persuaded that these floating phantoms, which she had begun to perceive, would lead to blindness. I found in her house twenty persons, whom I begged leave to question: out of the twenty, seven had seen them for a great number of years, without having ever spoken of them: one young person added, that she amused herself greatly in seeing them descend in the air."[8] "These muscæ," says Weller, "are evidently not observed, or are entirely neglected by those who, taken up by business, want leisure to think of their disease."[9] On the other hand, they are never so troublesome as when they coexist, either with some other affection of the eyes, such as asthenopia, or with disease of some other organ, such as dyspepsia. Any disorder which unfits one for exertion, and leads to brooding over one's complaints, such as hypochondriasis, is extremely apt both to lead to the detection of muscæ volitantes, and to fill the mind with apprehensions regarding their result.

Condition of the eyes of those affected with entohyaloid muscæ.—The eyes of those troubled with floating muscæ present no objective symptoms, by which the existence of such an affection can be detected. Yet eyes of normal conformation are seldom subject to muscæ volitantes. On the contrary, when a person complains much of this symptom, we always find him myopic or presbyopic; or perhaps myopic with the one eye, and presbyopic with the other. This shows that the interception of the rays, proceeding from external objects, by filaments in front of the retina, or even the formation of magnified shadows by diffraction, produces comparatively little effect when the remainder of those rays are brought accurately to focal points upon that membrane. Dilution of the images of external objects favours the perception of the muscæ, which, in their turn, are, to a certain extent, extinguished in perfect vision.

Exciting causes of entohyaloid muscæ.—Most of the patients who complain of pearly muscæ ascribe the origin of the affection to some exciting cause. It is extremely probable, however, that in many instances, there is merely a coincidence in point of time between the circumstances blamed by the patients and their first remarking the existence of the muscæ, and no such relation as that of cause and effect.

The following are among the exciting causes most frequently mentioned:—

1. Over-use of the eyes upon minute objects, as in reading, writing, painting, and the like. As often connected with this cause, may be mentioned intense application of the mind. Nor are the want of proper exercise and the bent posture of the body to be omitted as concurrents.

A gentleman who had been a few years in practice as a surgeon, and who had attended my lectures on the eye, came to me, complaining of muscæ. On inquiring whether he could trace them to any cause, he told me that he ascribed them to his having positively read through Cooper's Surgical Dictionary, a large book printed in a small type. He died not long after of apoplexy.

Charles Bonnet consulted Van Swieten about pearly muscæ which he saw, and which he attributed to too much use of the microscope. Van Swieten replied, that having employed the microscope himself too frequently, when a young man, in the examination of anatomical injections, he had brought on the very same appearances as his correspondent.[10]

Hanmann says[11], he brought on myodesopia by straining his eyes in the study of Greek, at a period when they were already weakened by previous disease.

Nothing serves so much to increase the perception of muscæ volitantes, as often searching for them through pinholes, lenses, &c. Such experiments seem to rouse them into existence, and he who has thus brought himself to discover them, continues to see them, and cannot get quit of them. "Almost all the mathematicians and all the microscopical observers that I know," says Walther[12], "have muscæ volitantes, which is, therefore, an appearance referrible to the strained state of the eye, and the too great use of sight."

2. It is a common opinion that muscæ are a sign of congestion in the head and eyes, and often the precursors of apoplexy. Over-use of the eyes probably acts detrimentally, by producing congestion. Other influences, likely to cause a determination of blood to the brain, are sometimes referred to by patients, as having brought on muscæ. Thus, the excitement attendant on sexual connection, while under the influence of wine, was mentioned to me by a patient as the cause which suddenly gave rise in him to muscæ volitantes.

3. Febrile diseases are very apt to bring on muscæ, and none more so than the epidemic catarrhal fever, called influenza.

Dr. Stark attributes the origin of the complaint in himself to a severe course of study while labouring under influenza, and at the same time straining his eyes in microscopic pursuits.[13]

4. Inflammatory diseases of the eyes are frequently followed by the pearly muscæ and their congeners. I have known not only retinitis, iritis, and postfebrile ophthalmitis to produce them, but even catarrhal conjunctivitis.

5. Want of the due quantity of sleep, the being roused from rest night after night, and above all watching during a number of successive nights, with little sleep even during the day, appear in many instances to bring on myodesopia.

6. Disordered digestion is often accused as a cause of muscæ. Nothing is more common, when such an affection of the eyes is spoken of, than for both patient and practitioner to exclaim, It is the stomach! Certain it is, that the disease is often met with in patients who are labouring under disorder of the stomach and bowels, being troubled with want of appetite, indigestion, acidity, flatulence, and costiveness.

7. Mr. Wardrop has pointed out a disturbed action of the heart as a cause of muscæ.[14] In consequence of some change in the action of the heart, or of its actual hypertrophy, the blood is distributed, he thinks, unequally to the brain and nerves, and amongst other effects, muscæ, which he terms "ocular spectra," are produced. Agitation of the circulation, a peculiar thrill in the pulse, swimming in the head, whizzing noise in the ears, and increased impulse of the heart, are amongst the attendant symptoms.

8. Another cause to which the origin of muscæ is often attributed, is what is styled nervousness, weakness of the nerves, an impaired state of the nervous system, or a morbidly sensible state of it. Thus, Mr. Lawrence speaks of the disease occurring "when the energy of the nervous system is impaired by pressure of business, by anxiety and distress, by severe and continued affliction, or overwhelming grief."[15]

Mr. Ware tells us, that when "a morbid sensibility is excited, like that which general debility or much anxiety is apt to occasion, the retina (which has a larger quantity of nervous medulla spread over it, in proportion to its dimensions, than any other part of the body) becomes morbidly impressed by any little points or projections that happen to be in contact with it." Pressure, then, on one or more minute points of the retina, and a morbid sensibility of the membrane, are regarded by Mr. Ware as the conditions on which muscæ depend. "The more common exciting cause of these motes," he adds, "appears to me to be too close application of the mind to objects that occasion anxiety or distress."[16]

Before making a few remarks on the exciting causes above enumerated, it may be proper to mention, that the entohyaloid muscæ, independently altogether of the degree of light to which the eyes are exposed, or the general state of body and mind of the person affected, are liable to vary from time to time in number and intensity, although much less considerably and less suddenly than some authors have represented. Hence the question, whether, invisible under ordinary circumstances, they become visible in consequence of an increased sensibility of the retina.

"This supposition," observes Sir David Brewster, "is by no means probable, because the muscæ are not visible by any light of their own, and an increase of sensibility in the retina would affect equally the luminous field on which they are seen. But as this point is of some importance both in a physiological and a medical aspect, I have submitted it," he goes on to say, "to direct experiment. With this view, I examined the muscæ in the morning before the sensibility of the retina had been diminished by exposure to day-light, and found that they were neither increased in number nor intensity. I varied this experiment by diminishing the sensibility of the retina This was done by holding a bright gas flame close to the eye, and near the axis of vision, till the retina lost its sensibility to all the rays of the spectrum, except a few of the more refrangible ones. In this case, too, the muscæ were as numerous and distinct as before, and we may therefore consider it as certain, that the muscæ described by Mr. Ware, in so far as they were of the same character as those in the healthy eye, are not affected by any variation in the sensibility of the retina." [17]

If we examine into the probable mode of action of the several exciting causes of muscæ, we shall find that all of them have a tendency to produce a determination of blood to the vessels of the head and eyes. Over-use of the eyes upon minute objects, intemperance, the venereal orgasm, a union of these, febrile diseases, extraordinary excitement or actual disease of the heart, it will readily be granted have this tendency. As for disordered digestion, which is often blamed for producing myodesopia, I suspect that in most cases the disorder of the stomach and the affection of the eyes are merely coincident effects, arising from one and the same cause; such as improper diet, neglect of the bowels, a torpid condition of the liver, and very frequently, even when it is least suspected, the use of alcohol, especially in the shape of drams and cordials. Pressure of business, anxiety, distress of mind, and grief, which form another set of exciting causes, operate in all likelihood exactly in the same way, producing (it may be in persons of feeble health) congestion of the head and eyes.

Nor is want of sleep an exception to the general principle, that all the exciting causes of myodesopia act by producing congestion. Whether watchfulness arises from disease, artificial means employed to produce it, as the use of coffee, which Bereis[18] particularises as a cause of muscæ, the urgent calls of professional occupation, or prolonged study, it always leads to an irregular action of the circulating system, and an unnatural determination of blood to the organs of vision.

Prognosis in cases of entohyaloid muscæ.—As the muscæ of this class often occur suddenly, the patient is apt to be alarmed by their appearance, and to suppose that he is about to lose his sight by cataract or by amaurosis. We may calm his fears on these heads, for with neither cataract nor amaurosis have these spectra any connection. Even on the supposition that a gradual increase of the muscæ is to take place, not even the greatest possible accumulation of them can ever end in the production of an amaurosis, and much less of a cataract. It will be well, however, in any case in which the practitioner is consulted, to ascertain whether, independently of the muscæ, there be any symptoms of either of these two diseases present. The presence or absence of cataract we ascertain by the use of the catoptrical test. (See p. 742.) We have no such simple or certain test of amaurosis. But if the pupil moves with its natural vivacity, and the patient is able to read a small type with the suspected eye, we may assure him it is not affected with amaurosis.

A question which the patient is very likely to put to us is, whether the floating motes and threads which he sees are not liable to increase, and that to such a degree as at length to deprive him of sight. That they increase is true, although only very slowly, and never to such an extent as materially to interfere with vision. Even when the whole field of view presents entohyaloid spectra, the patient is still able to read, although, as he continues to do so, the muscæ sometimes gather together, so as to render portions of the page before him temporarily obscure. Very often they remain stationary for ten or twenty years, or increase by almost insensible degrees; and, although alarming at first, the patient gets habituated to them, and troubles himself no more about them. I believe the increase of myodesopia arises more from the eye becoming in a greater degree susceptible to the impressions of the bodies which cause this disease, than from any increase of the bodies themselves. This increasing susceptibility arises from overuse of the eyes, and from searching for and examining the muscæ too much.

Many authorities might be quoted to prove, that entohyaloid muscæ increase only with extreme slowness, or remain entirely stationary, and sometimes become even less perceptible.

"I know many people who have complained to me of such things fifteen and twenty years ago, and who are still at this moment in the same state."[19] — *Maître-Jan.*

"These kinds of phantoms, which increase sometimes very slowly during the first five or six years, continue during the whole remainder of life without any kind of inconvenience. * * * I know a great number of persons who have seen them thirty, forty years, and more, without their number or their figure having undergone the slightest change."[20] — *Demours.*

"Twenty-five years after I had been first consulted in this case I again saw the patient. She then enjoyed good health and spirits. The motes were still occasionally perceived; but they had become so faint, that she could only see them in a strong light, and when she took pains to look for them. It ought, however, to be mentioned, that at this time her daughter was just married, whereas, when she first consulted me, she had lately lost her husband."[21] — *Ware.*

"Twelve years afterwards, I had occasion to see this gentleman again; when he informed me that he retained the perfect sight of both eyes, and could distinguish the most minute objects with either of them. In a bright light, however, he still perceived the motes as before, if he took pains to look for them; but he was now so much accustomed to their appearance that they did not occasion any uneasiness."[22] — *Ibid.*

"It is certainly for from twenty to thirty years that I have seen these same appearances," says Prevost, at the age of 50; and, at the age of 79, he adds,— "Since, up to a very advanced age, I have enjoyed very good sight, I may support, by my case, the opinion of the oculists who reckon these appearances of small importance."[23]

"They are quite innocent in their nature, and exist in persons whose powers of vision are most acute. I have been subject to them from childhood."[24] — *Müller.*

Treatment of entohyaloid muscæ. — Entohyaloid or floating muscæ are not much under control, and are very seldom removed by medical applications. If of old standing, and not increasing, it is needless to interfere. When of recent origin, and the exciting cause evident, they are sometimes cured.

The treatment most likely to be useful is as follows: —

1. The patient must be put on his guard against the exciting causes, and carefully avoid them; such as too much straining of the sight, excess of every sort, night-watching, and the use of alcohol in any form or quantity. "The only means which often does good in this disease," says Walther, "is rest of the eyes, and abstaining from every employment which strains the sight. I know patients who have got completely free of muscæ volitantes which they had seen for several years, by giving their eyes long-continued rest, which, however, again appeared, as soon as they wrought for some days, so as to strain their sight.[25]

2. If the stomach is weak, and the bowels costive, a course of laxatives, followed by tonics, should be prescribed. To strengthen the constitution, and especially the nervous system, should by every likely

means be attempted. This indication will best be answered by cinchona, steel, and the cold bath. Richter mentions the case of a lady, who was troubled with this disease after a difficult labour, and who was completely freed of it by the continued use of sulphuric ether. In another case, in which the digestion was much impaired, and the patient troubled with acid eructations, a mixture of ox-gall and assafœtida was of great use.[26] The patient must carefully avoid such articles of food or drink as induce acidity, flatulence, and the other signs of indigestion. Dr. Cheyne mentions[27] a case in which the patient was cured by giving up the use of sugar.

3. A torpid state of the liver requires small doses of the blue pill, either by itself or combined with purgatives. I have known a gentle course of mercury successful in curing the disease, probably by its sorbefaciant powers. Iodide of potassium, I have also found completely successful in removing muscæ volitantes of recent standing.

4. Where the symptoms of determination of blood to the head are well marked, venesection or arteriotomy, leeches to the head or cupping, and counter-irritation are indicated. Of twelve cases treated by Dr. Schlagintweit, eight, we are told, were cured by solvent and derivative medicines, and by bleeding at the foot.[28]

5. When muscæ appear to depend on disease of the heart, leeches are recommended by Mr. Wardrop to be applied over this organ till its impulse is diminished. The fulfilment of this indication may be promoted by small doses of antimony and the use of laxatives. If the patient complains of cold feet, the warm pediluvium is to be used at bed-time; and it may be remarked, that this simple remedy is of great importance, where the disease is connected with a difficulty of obtaining sleep. An irritable state of the heart, remaining after its impulse is subdued, Mr. Wardrop endeavours to remove by the exhibition of sulphate of iron.

6. Antispasmodics appear to have been chiefly confided in by Ware in the treatment of muscæ; such as, two or three times in the day a small dose of the volatile tincture of valerian, mixed with an equal quantity of tincture of castor, and joined occasionally with the camphor mixture, or with infusion of cascarilla.

7. Exercise in the open air, and a change of residence, with such occupations and amusements as are likely to withdraw the mind from any source of anxiety or distress, are found to be beneficial. A course of mineral waters has sometimes been successful, probably more from the change of scene, hilarity of mind, exercise of body, and regularity of habits, by which such a course is accompanied, than from the effects of the waters themselves.

8. If the eyes feel hot, heavy, or uncomfortable, they should be bathed with either some cold or some warm application, according as the patient feels the one or the other the more agreeable. Cold water, or a cold lotion, consisting of water with a small proportion of the spiritus ætheris nitrosi, will answer in the one case; tepid water, or a tepid infusion of any aromatic herb in the other. Sponging the forehead, temples, and outside of the eyelids, morning and evening, with camphorated spirit of rosemary, eau de Cologne, or the like, is also to be recommended.

9. Rust, it seems[29], continued to recommend the practice of puncturing the cornea in cases of myodesopia, a thing originally proposed with the view of allowing the cause to escape out of the eye, and tried unsuccessfully by Demours: but which in Rust's hands was followed, we are told, by the vanishing of the muscæ If it really were so, the operation probably acted in a similar way as it is known to do in cases of ophthalmia, by giving relief to the turgescent state of the vessels.

II. MYODESOPIA INSENSITIVA.

Fixed spectra.—The fact, that there occur certain *fixed muscæ*, which, once fairly formed, never change their position, either with respect to one another or to the optic axis, naturally leads us to seek for some natural example of a fixed spectrum analogous to the prototypes of the various sorts of muscæ already considered, all of which possess a real as well as an apparent motion. The *vascular spectrum*, as produced in the experiment of Purkinje, and the appearances known by the name of *accidental colours*, are the only examples of the kind which occur to me.

Blood-vessels and central spot of the retina, as seen in the experiment of Purkinje.—The eyelids of the unemployed eye, say the left, should not be closed; but the light should be prevented from falling on it, by the hand or other covering. The right eye, then, being steadily directed forwards, a lighted candle (the room being otherwise dark) is to be moved slowly upwards and downwards at the temporal side of the eye, or right and left below it. In a few seconds, the blood-vessels of the retina, with all their ramifications, are distinctly seen, of a dark hue, projected on a grayish-white ground, as if about a foot before the eye, and greatly magnified.

It is indispensable that the light be in motion; for as soon as it becomes stationary, the image breaks into fragments and vanishes. Although an example of a fixed spectrum, it is to be observed, that during the motion of the light the image also moves, and in a direction contrary to that of the light; a consequence, I presume, of the distance between the vessels and the sentient layer of the retina. No spectrum arises when the light is moved to and from the eye, nor when the eye is alternately shaded and uncovered.

When it is the right eye which is the subject of the experiment, the part of the spectrum corresponding to the entrance of the optic nerve appears, of course, to the right hand of the observer; and from that part two vascular trunks are seen to go upwards and two downwards, whence they are prolonged in an arched form towards the left, vanishing towards the middle of the field. The part of the spectrum corresponding to the central spot of the retina, Purkinje describes as presenting a circular concave appearance.

Purkinje has offered no explanation of this very striking experiment. The following attempt to supply the omission, I presume to be from the pen of Mr. Wheatstone[30]:—

"Were the blood-vessels which are spread on the anterior surface of the retina entirely opaque, they would prevent the transmission of light to the nervous matter beneath them, and their distribution would be constantly visible; but they are transparent, and, in ordinary cases, the intensity of the light which passes through them does not materially differ from that which falls directly on the retina. When, however, the retina is fatigued by a strong light, the veins become visible, because the retina is rendered insusceptible to a portion of the light they transmit; but this effect is only momentary, for those parts which are thus shaded from the more intense light promptly recover their usual susceptibility, and the images vanish; but they may again be made perceptible by displacing them on the retina, and by making them constantly change their places the images may be rendered permanent."

Purkinje and Wheatstone have pointed out methods by which the more minute vessels of the retina, along with the central spot, may be rendered visible. The following is one of the readiest:—

Before one eye, directed towards a plate of ground-glass, or sheet of paper, held close before a candle, move from side to side, in a tremulous way, a black card with a hole in it one-tenth of an inch in diameter. The image of the light upon the retina being in this way continually displaced, an extremely complicated network of blood-vessels appears, of a grayish-white colour, in which the ramifications of the upper trunks are seen to anastomose with those of the lower; while in the very centre of the field there is a small dark circle, in which no trace of vessels appears, the spectrum of the central spot.

Accidental colours.—In such experiments illustrative of the production of accidental colours as those referred to in the preceding section, the spectrum, though fixed when the eye is at rest, moves with the motions of the eye upwards or downwards, or from side to side, on our calling into action the appropriate muscles, and this even although the eyelids are shut. If we make an impression, for example, on the retina by means of a coloured wafer, and merely shut the eye, as the pupil is somewhat raised in this action by the eyeball becoming equipoised between the rectus superior and inferior, the spectrum appears in a horizontal direction, or a little elevated, and continues so till by a voluntary exertion we turn the eye into some other direction. Immediately on again calling into activity the orbicularis palpebrarum, the eyeball rolls upwards, and the spectrum rises.

The spectra in such experiments are generally evanescent; but by increasing the light by which they are produced to an intense degree, they may be rendered more or less durable; as in the case of Sir Isaac Newton, who, by looking at the image of the sun reflected from a mirror, produced a luminous spectrum edged with colours, to get quit of which he was obliged to shut himself up in a dark room for three days; and in the instance mentioned by Buffon of one of his friends, who, having looked at an eclipse of the sun through a small hole, observed a coloured image of that body upon all objects for more than three weeks.

Persistent spectra—*Fixed muscæ.*—There is reason to believe, not only that *fixed muscæ*, as they are termed, bear, in some instances, a resemblance to the spectra of which we have been speaking, in their form and in the sort of affection of the retina upon which they sometimes depend, but that they are in certain cases nothing else than persistent spectra, the consequences of over-excitement of the nerve of vision, and exhaustion of its sensorial power. Buffon's own case may be quoted as an instance of this kind.

"I have seen," says he, "black points, for more than three months, in so great a number that I was very uneasy about them. I had apparently fatigued my eyes in making and too often repeating the preceding experiments [on accidental colours], and in looking sometimes at the sun; for the black points appeared at that very time, things which I had never seen before. At last they annoyed me so much, especially when in broad daylight I looked at objects strongly illuminated, that I was obliged to turn my eyes away: yellow, especially, was insupportable to me; and I was obliged to change the yellow curtains in the room which I occupy, and to put up green ones. As I avoided looking at all colours which were very strong, and at all brilliant objects, gradually the number of black points diminished, and at present I am no more troubled with them. What convinced me that those black points arose from too strong an impression of light is, that after looking at the sun I always saw a coloured image, which for a certain time covered all objects; and, watching with attention the different gradations of this coloured image, I observed that it lost its colour by degrees, so that at last I saw upon objects only a black blotch, at first pretty large, but which gradually diminished, and ultimately was reduced to a black point."[31]

Some fifteen years after the attack thus described, Buffon, who studied much and was very short-sighted, had another, commencing with photopsia, followed by the spectrum of a dark ring or disk before his left eye, covering all objects and preventing him from reading. After a day and two nights it grew less, so as to allow him to see objects to the right and below. For fifteen days he could not see the pen with which he wrote. His eyes then became inflamed, which obliged him to give them rest, and after the space of some months, the spectrum broke up into fragments, and his sight was restored.[32]

Various appearances of retinal or fixed muscæ.—Fixed muscæ are sometimes single; often more numerous. They are of different sizes, and present a great variety of forms. They are not always fixed from the very first, but after affecting one side of the optic axis may shift to the opposite side, a fact indicating perhaps their dependence on an effusion of blood from the retinal vessels. They are sometimes semi-transparent at first, but afterwards their colour is generally black, or at least much darker than the colour of the floating or entohyaloid muscæ. They are often so black that even when both eyes are open, although the musca affects only one, a person's countenance standing before the patient seems obliterated, or his head cut off, or the flame of a gas-lamp extinguished. Their colour changes, however, in a remarkable manner, appearing of a grayish-white while the eye is shut, and instantly assuming a velvet black colour on opening the eye in the light. Sometimes on shutting the eye the fixed musca is seen of the colour of the object which last impressed the retina.

White objects, in consequence of fixed muscæ, sometimes seem to have black, ill-defined, large blotches on them. Sometimes the patient sees the appearance of black letters, like T or X, for instance, in the air. In other cases, he describes himself as seeing through a riddle, the interstices of which become gradually less and less, till the disease ends in total blindness.

A fixed musca, occupying the centre of the field of vision, and gradually expanding its circumference, ends in one of the most intractable varieties of amaurosis. It is to be attributed to a change of structure in the central spot of the retina, the evident result, in some instances, of over-excitement of the eye in the continued observation of minute objects. "The appearance I see," said a literary man to me, who was losing his sight, "is that of a dark wafer covering the middle of objects. It is getting broader and broader, for formerly I could read past the edge of it, but now I cannot."

Müller tells us, that the vascular figure, observed in Purkinje's experiment, is sometimes seen with a luminous character. "I have frequently seen," says he, "this luminous ramified figure in the dark field of vision, when, after ascending a flight of stairs, I have found myself suddenly in a dark place, and also when I have suddenly immersed my head in bathing. The luminous appearance is evidently the effect of the pressure of the vessels filled with blood upon the retina."[33] Now, moderate pressure on the retina always produces a luminous sensation; but if the pressure is increased, darkness is the result. Patients sometimes mention the appearance of a spider, with its legs stretched out from it, as a spectrum which they observe; but this, I believe, will generally be found, when the patient is directed carefully to examine it, to be a pearly or floating musca. Were it ascertained in any case to have no real motion, and not to throw a double image on the retina when exposed to two divergent beams of light, we should be led to ascribe it to a varicose state of the blood-vessels of the retina. That this was the cause of a peculiar appearance in a poor woman who was under my care, completely amaurotic of one eye, and fast losing the sight of the other, seemed not improbable. "For some time," said she, "I have seen like two bushes before this eye, and now the two are meeting."

As the eyeball moves, the fixed musca seems to move with a corresponding velocity; an example of which we have in carpologia, or picking at the bedclothes. The figure of a mouse running along the floor is a spectrum, which I have known to arise from an insensible portion of the retina, and to be the precursor of total amaurosis. The distinction, then, of the fixed from the floating muscæ, requires considerable attention and power of observation on the part of the patient. Sometimes he is affected with both sorts. Thus, Hellwag tells us, that on looking through a pinhole in a card, he saw two sorts of appearances, viz. five fixed dark spots, which changed their position with respect neither to one another nor to the optic axis, together with a semitransparent moveable web of twisted chains.[34]

Vascular diseases of the retina probable causes of fixed muscæ.—That the diseased state of the blood-vessels of the retina, in which they become suddenly distended much beyond their natural diameter, or even give way, so that blood is effused on the surface, or into the substance of the membrane (*apoplexia retinæ*), may, by compression, give rise to a partial abolition of vision and to fixed muscæ, is generally admitted. The same is likely to hold true of partial dilatation of its arteries and varicose enlargements of its veins. The central artery has been met with in a state actually aneurismal.

Fixed muscæ from partial paralysis of the retina.—It has been presumed that the nervous substance of the retina is liable to become insensible in certain portions of its extent, altogether independently of any affection of its blood-vessels. Andreæ compares this supposed state of the retina to the condition of the brain in nervous apoplexy, and calls it a loss of power from want of sufficient vital support. He says, that the muscæ depending on this cause vanish for a time, under the influence of different physical and moral stimulants, such as a jovial meal, a glass or two of wine, or cheerful conversation.

Fixed muscæ from melanosis and neuromata of the retina.—It can scarcely be doubted, that both the small black points, which, in certain cases, are deposited on the concave surface of the retina, constituting what is termed *melanosis retinæ*, and the larger red bodies, which, in other cases, are met with on its convex surface, and are called *neuromata*, must give rise to fixed muscæ.

Case 867.—Langenbeck relates the case of a man, long and exceedingly troubled with muscæ. On dissection, neither the aqueous humour, carefully preserved, and examined with the microscope, nor the lens, nor the vitreous humour, showed any thing unnatural. The retina, to the naked eye, and the coats of the eye, seemed normal. The vessels of the retina were not enlarged, and were neither more numerous nor fuller of blood than usual. On examining the retina microscopically, the whole internal surface was seen to be covered with blackish or brown points, formed apparently of molecules of pigmentum nigrum, accumulated into little globules about ten times bigger than the medullary globules of the retina. They were disposed equally, and in a certain sort of order, over the retina, following chiefly the course of the blood-vessels. They were detected in each retina, but were blacker and more numerous in the left.

The patient was never altogether free from myodesopia, although, at certain times, especially after drinking spirits, the disease increased. Certain of the phantasms which he saw, floated before his eyes; others, and these the more numerous, remained fixed. In writing, he complained that the paper seemed sprinkled over with snuff; and so similar were the spectra which he saw to grains of snuff, that he often tried to brush them away.

The little tumours, called *neuromata*, appear to arise from chronic retinitis; they cover the convex surface of the retina, being of a red colour, pellucid, and somewhat prominent; some of them are visible to the naked eye upon dissection, being twice as big as poppy seeds, others so small as not to be seen without the microscope. They are mixed with black points, and surrounded by striæ of pigmentum nigrum. Some of them are depressed in the middle into a sort of umbilicus, and have a black point within. They are embedded in the cortical substance of the retina, and may perhaps be morbid enlargements of the medullary globules of the retina. The cellulo-vascular layer of the retina, in such cases, is thicker and firmer than natural, of a whitish colour, furnished with red vessels, and easily separable from the other layers. Such is the account of this morbid state of the retina, which is given by Langenbeck.[35]

It is merely a conjecture, that neuromata will in an early stage cause fixed muscæ. Ultimately they produce complete amaurosis, or, at any rate, are met with in eyes which were completely deprived of sight.

We cannot be too cautious in coming to conclusions respecting the pathological states likely to give rise to certain symptoms which affect vision, or on the other hand respecting the symptoms likely to attend certain morbid alterations of the retina. Retinitis, for example, which, contrary to what might perhaps be expected, is not attended with pain, produces, by an effusion on the concave surface of the retina, a general dimness of sight, and after this abates under treatment, the appearance, not of fixed, but of floating muscæ. Neuromata, being seated on the convex surface of the membrane, are more dangerous to vision than melanosis, which, on the other hand, is more apt to produce fixed muscæ, without causing total blindness. The intimate relation which exists between the different portions of the retina, considered as a sensorial surface, and the reciprocal action which they have upon one another, are probably much stronger on the convex than on the concave side of the membrane, belonging, in fact, more to its nervous than to its vascular structure. Hence, neuromata may, by irradiation, produce complete amaurosis, while melanosis merely causes fixed muscæ. The melanotic points, although extremely numerous, do not destroy vision, because they are seated in the least important of the textures of the retina; the neuromata, although fewer, so as to leave numerous spaces where the retina is probably uninjured, abolish sight entirely, from the morbid condition of one part of its nervous matter having a certain influence on the neighbouring parts, a fact analogous to what is known respecting the function of the retina in the healthy state.

Diseased states of the choroid probably productive of fixed muscæ. — If we are obliged to speak with some reserve even of the retina, as the seat of the efficient causes of fixed muscæ, with still less confidence can we assign such causes to the choroid. Necroscopic observations are here entirely deficient, so that we can state it merely as a probability, that partial thickenings of the choroid, dilatations of its vessels, or depositions on its surfaces, by pressing on the retina, may cause photopsia in the first instance, and afterwards fixed muscæ.

Diseased states of the optic nerves, and of the brain, probably productive of fixed muscæ. — As diseases of the optic nerves, and of the encephalon, cause luminous sensations, even after the eyeball is extirpated, so they are the causes of dark spectra, and of partial amaurosis. Disease of the brain is well known to produce hemiopia.

Case 868.—Dr. Delafield relates[36] the case of an elderly gentleman, who afterwards became totally blind, one of whose early symptoms was, that, in walking, he imagined he saw objects on the ground which intercepted his path, and which he endeavoured to avoid by taking long and high steps. These spectra were perhaps fixed muscæ. On dissection, the eyes seemed in all respects sound, and had the plumpness and clearness of health. No mention is made, however, of any microscopical examination of the retina. The ventricles of the brain were greatly surcharged with fluid, and the optic nerves to and from the *ganglion opticum* [chiasma ?] shrunk, or rather absorbed, so that they appeared flat, and were of a straw colour. Only the sheath of the nerve remained; the medullary substance having entirely disappeared.

Symptoms coincident with fixed muscæ.—In most of the cases in which fixed muscæ are a prominent symptom, there will be found a combination of various other subjective symptoms; such as photopsia, or the sensation of coruscations and halos of light; floating muscæ; the retina unnaturally retentive of impressions; ocular spectra; the alternate disappearance and reappearance of small objects; hemiopia; partial and oblique vision; chrupsia; the sensation of an undulating cloud before the eyes, with occasional openings in it, through which small objects are seen by fits, and then are obscured again; bright objects exhibiting a tremulous or undulating light and shade; the edges of objects ill defined and shaggy, as if fringed with hoar-frost; perpendicular lines appearing disfigured, printed letters broken or indented, and circular objects deprived of their regular figure. What belongs to the fixed muscæ must not be confounded with what depends on other causes. An interesting case of this mixture of symptoms, the reader may find recorded by the patient himself, Mr. Keir, in the Lancet for October 1, 1842. The case of Professor Boze affords another example of the same thing. Besides the sensation of a disc before one of his eyes, objects appeared curved, misshapen, and fringed; letters seemed broken; objects were as if coloured blue and green; the disk grew broader and more opaque, and at last the vision in one-half of the retina was extinguished, the other half seeing as if through a thick fog.[37]

Treatment of fixed muscæ.—Most of the cases of fixed muscæ are incurable, as may be concluded from the nature of the efficient causes upon which they depend. The cases susceptible of treatment are most likely to be benefited by depletion of various kinds, mercury, iodide of potassium, and counter-irritation, followed up by general and local tonics, so as to relieve the over-distended state of the vessels, and restore them to their natural diameter. If the disease arises from the suppression of any habitual discharge, an attempt should be made to renew this, or to procure a substitute for it. The best local application is cold water, applied to the eyes and face by means of folded pieces of cloth. Richter remarks, that by this means alone, the disease has sometimes been completely removed; an instance of which, indeed, seems to have occurred in the case of Boerhaave, as thus related by himself:—"In æstu solis summo mihi equitanti per loca arenosa enascitur magna macula in fundo oculi. Cogitanti succurrit mihi, medicamentum optimum fore aquam frigidissimam, quæ a me appli-

cata remedio fuit: Inflammatio ergo procul dubio erat in fundo oculi, et sæpe etiam fit tali in casu, hinc optimum remedium est, quod subito retropellendo omnia vasa constringit, ut aqua frigida."[38]

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[1] Edinburgh Medical and Surgical Journal, July, 1845, p. 38. On the methods of examining spectra, see Histoire de l'Académie Royale des Sciences, pour 1760, p. 57; Paris, 1776: Kater, at the end of Guthrie on Extraction of a Cataract; London, 1834: Jago, London Medical Gazette, May 9 and 16, 1845: Appia, Archives d'Ophthalmologie; Tome i. p. 49; Paris, 1853.

[2] Transactions of the Royal Society of Edinburgh; Vol. xv. p. 381; Edinburgh, 1843.

[3] Mémoires de la Société de Physique et d'Histoire Naturelle de Genève; Tome v. p. 244; Genève, 1832.

[4] Beer, Lehre von den Augenkrankheiten; Band ii. p. 424; Wien, 1817.

[5] Op. cit. p. 382.

[6] Ibid., p. 384.

[7] Archives Générales de Médecine; Tome xxiii. p. 113; Paris, 1830.

[8] Traité des Maladies des Yeux; Tome iii. p. 422; Paris, 1818.

[9] Icones Ophthalmologicæ, p. 40; Lipsiæ, 1824.

[10] Mémoires de la Société de Physique et d'Histoire Naturelle de Genève; Tome v. p. 262; Genève, 1832.

[11] Ammon's Monatsschrift für Medicin, Augenheilkunde und Chirurgie; Vol. iii. p. 427; Leipzig, 1840.

[12] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. iii. p. 19; Berlin, 1822.

[13] Edinburgh Medical and Surgical Journal; Vol. lx. p. 399; Edinburgh, 1843.

[14] Lancet, September 13, 20, 1834, pp. 887, 924.

[15] Treatise on Diseases of the Eye, p. 582; London, 1841.

[16] Medico-Chirurgical Transactions; Vol. v. pp. 266, 272; London, 1814.

[17] Op. cit. p. 383.

[18] Dissertatio de Maculis ante Oculos volitantibus; Helmstädt, 1795; quoted by Andreæ, Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. viii. p. 16; Berlin, 1825.

[19] Traité des Maladies de l'Œil, p. 281; Troyes, 1711.

[20] Op. cit.; Tome iii. p. 421.

[21] Op. cit. p. 258.

[22] Ibid., p. 260.

[23] Op. cit. p. 247.

[24] Elements of Physiology, translated by Baly; Vol. ii. p. 1214; London, 1842.

[25] Op. cit. p. 20.

[26] Richter's Anfangsgründe der Wundarzneykunst; Band iii. p. 514; Göttingen, 1804.

[27] Cases of Apoplexy and Lethargy, p. 154; London, 1812.

[28] Ammon's Zeitschrift für die Ophthalmologie; Vol. ii. p. 47; Dresden, 1832.

[29] Chelius, Handbuch der Augenheilkunde; Vol. i. p. 371; Stuttgart, 1843.

[30] Journal of the Royal Institution of Great Britain; Vol. i. p. 111; London, 1831.

[31] Mémoires de l'Académie Royale des Sciences, pour 1743, p. 156; Paris, 1746.

[32] Histoire de l'Académie Royale des Sciences, pour 1760, p. 55; Paris, 1766.

[33] Op. cit.; Vol. ii. p. 1211.

[34] Referred to by Andreæ, Op. cit. p. 21.

[35] De Retina Observationes Anatomico-pathologicæ, p. 159; Gottingæ, 1836.

[36] Notes and Additions to Travers' Synopsis of the Diseases of the Eye, p. 514; New-York, 1825.

[37] Histoire de l'Académie Royale des Sciences, pour 1760, p. 54; Paris, 1766.

[38] Prælectiones Publicæ de Morbis Oculorum, p. 62; Gottingæ, 1746.

SECTION X.—SPECTRAL ILLUSIONS.

The phenomena falling under this head may be referred, in one set of cases, merely to the insensibility of the eye to direct impressions of faint light; while another set must be regarded as symptoms of disorder in the nervous optic apparatus, or in that part of the brain with which it is connected.

I. Sir David Brewster observes, that when the eye is steadily directed to objects illuminated by a feeble gleam of light, it is thrown into a state nearly as painful as that produced by an excess of light. A remission takes place in the conveyance of the impressions; the object actually disappears, and the eye is agitated by the recurrence of impressions too feeble for the performance of its functions.

These facts "may serve to explain," says Sir David, "some of those phenomena of the disappearance and reappearance of objects, and of the change of shape of inanimate objects, which have been ascribed by the vulgar to supernatural causes, and by philosophers to the activity of the imagination. If in a dark night, for example, we unexpectedly obtain a glimpse of any object, either in motion or at rest, we are naturally anxious to ascertain what it is, and our curiosity calls forth all our powers of vision. This anxiety, however, serves only to baffle us in our attempts. Excited by a feeble illumination, the retina is not capable of affording a permanent vision of the object, and while we are straining our eyes to discover its nature, it will entirely disappear, and afterwards reappear and vanish alternately."[1]

II. Certain spectral illusions, as is well known, attend *delirium tremens* or *mania à potu.* The patient supposes his chamber to be haunted by cats, snakes, and various other spectres, and often calls for assistance to drive them away. He imagines vermin to be crawling over his bed, and endeavours to pick them off; or frequently puts out his hand, as if to catch something floating before him in the air. In some cases of this sort, both sense and judgment are affected; but in other cases, sense only. In the latter cases, the patient is readily convinced that he is labouring under illusions; in the former, his delirium prevents this conviction.

The explanation generally given of illusions of the senses, either during *delirium tremens*, or under circumstances such as I shall notice under the next head, is, that perception being in ordinary cases attended by some unknown motion or change in the brain, in *delirium tremens,* and in various other states of disease, the brain is so altered, that if the person happens but to think of any past impression, the same change in the brain is repeated as in actual perception.

III. Spectres, or resemblances of natural objects often present themselves, as it were, to the eye, in cases where the light is sufficient, and the state of general health unimpaired. We are highly indebted to Dr. Ferrier[2], of Manchester, for the light he has thrown on this class of spectral illusions. Admitting the reality of spectral impressions, occurring without any sensible external agency, he regards the general law of the system to which the origin of such impressions may be referred, to be the renewal of actual impressions formerly made on the sensorium, and has applied this principle to the explanation of visions and apparitions. The subject has been farther pursued by Dr. Hibbert, in his *Sketches of the Philosophy of Apparitions.* He traces this class of phenomena to a great variety of causes; as, highly-excited states of particular temperaments, hysteria, hypochondriasis, the neglect of accustomed periodical blood-letting, febrile and inflammatory affections, inflammation of the brain, &c.

The spectral illusions, now referred to, are infinitely various; sometimes bearing the aspect of a single person, or other object, and in the other cases, imitating the impression which might be produced by crowds of human beings, moving before the spectator, or by scenes of endless diversity. Many patients affected with such visions, are unable to distinguish them from real sensations, and call upon the spectators to look at the objects of their terror or surprise; others, though they can scarcely persuade themselves that the impressions under which they labour do not arise from external objects, feel a degree of diffidence in announcing what they see to the bystanders, whose society they sometimes seek only in order to dissipate the intruders; while a third set are perfectly conscious from first to last that they are labouring under a disease, which renders them the subjects of false perceptions. In some cases, the patient observes that the spectral appearances always follow the motion of the eyes; in other cases, where, probably, the disease affects the sensorium more than the mere optic apparatus, the visions move in succession before the patient, or stand still before him, uninfluenced by the motion or direction of his organs of vision.

Some patients see spectres only when their eyes are open, and dispel them by closing them; others, the reverse. Those who have once become affected with spectral illusions, are very apt to be troubled with them again, or may even fall into such a facile state in this respect, that they are often at a loss to know whether what presents itself to them in the ordinary intercourse of life is reality or illusion.

Treatment.—The beneficial effect of sleep, procured by opium, in banishing the phantasms of those labouring under *delirium tremens*, is well known. Other sorts of remedies will be required in other cases, and will sometimes operate in a manner almost equally striking. Witness the effects of depletion, in the celebrated case of Nicolai, the Berlin bookseller, who, for nearly two months, was constantly affected with spectral illusions.

"Though at this time," says he, "I enjoyed rather a good state of health, both in body and mind, and had become so very familiar with these phantasms, that at last they did not excite the least disagreeable emotion; but, on the contrary, afforded me frequent subjects for amusement and mirth: yet, as the disorder sensibly increased, and the figures appeared to me for whole days together, and even during the night, if I happened to wake, I had recourse to several medicines, and was at last again obliged to have recourse to the application of leeches to the anus.

"This was performed on the 20th of April, at eleven o'clock in the forenoon. I was alone with the surgeon; but during the operation the room swarmed with human forms of every description, which crowded fast, one on another: this continued till half-past four o'clock, exactly the time when the digestion commences. I then observed that the figures began to move more slowly; soon afterwards the colours became gradually paler; every seven minutes they lost more and more of their intensity, without any alteration in the distinct figure of the apparitions. At about half-past six o'clock, all the figures were entirely white, and moved very little, yet the forms appeared perfectly distinct; by degrees they became visibly less plain, without decreasing in number, as had often formerly been the case. The figures did not move off, neither did they vanish, which also had usually happened on other occasions. In this instance, they dissolved immediately into air; of some, even whole pieces remained for a length of time, which also by degrees were lost to the eye. At about eight o'clock there did not remain a vestige of any of them, and I have never since experienced any appearance of the same kind. Twice or thrice since that time, I have felt a propensity, if I may be so allowed to express myself, or a sensation, as if I saw something, which in a moment again was gone."[3]

Even a change in the position of the body, such as may possibly modify the state of the circulation through the brain, has sometimes been known to dissipate the phantasms produced by disordered sensation. "I know a gentleman," says an anonymous writer on this subject, "at present in the prime of life, who, in my opinion, is not exceeded by any one, in acquired knowledge, and originality of deep research; and who, for nine months in succession, was always visited by a figure of the same man, threatening to destroy him, at the time of going to rest. It appeared upon his lying down, and instantly disappeared when he resumed the erect posture."[4]

It must prove highly beneficial to those who labour under such disordered sensations, to be made acquainted with the fact, that they are merely the subjects of a peculiar disease of the internal optic apparatus, the effect of which is to produce a repetition or imitation of former impressions. By this means the minds of those may be calmed, who otherwise might be led to ascribe their visions to supernatural powers, or who through fear or terror might be driven to insanity.[5]

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[1] Edinburgh Journal of Science; Vol. iii. p. 209; Edinburgh, 1825.

[2] Essay towards a Theory of Apparitions; London, 1813.

[3] Nicolai's Memoir, Nicholson's Journal; Vol. vi. p. 161; London, 1803.

[4] Nicholson's Journal; Vol. xv. p. 289; London, 1806.

[5] The reader who wishes to pursue the subject of *Spectral Illusions*, in addition to the works already referred to, may consult the following: Alderson, Edinburgh Medical and Surgical Journal; Vol. vi.: Armstrong, Ibid.; Vol. ix.: Burton Pearson, Ibid.: Simpson, Phrenological Journal, No. 6: Edinburgh Journal of Science, for April, 1830: Streeten, Midland Medical and Surgical Reporter, Vol. ii.: Sutton's Tracts on Delirium Tremens, &c.: Scott on Demonology and Witchcraft, p. 16; London, 1830: Brewster on Natural Magic, p. 37; London, 1832: Craig and Craigie, Edinburgh Medical and Surgical Journal; Vol. xlvi. pp. 334, 353: Paterson, Ibid.; Vol. lxx. p. 170: Abercrombie's Inquiries concerning the Intellectual Powers, pp. 62, 349; Edinburgh, 1830: Bostock's Physiology; Vol. iii. p. 204; London, 1830.

SECTION XI. — ASTHENOPIA.

Syn.— Asthenopia, from α *privative*, σθένος, *strength*, and ὤψ, *the eye*. Debilitas visus. Hebetudo visus. Impaired vision, *Tyrrell*. Muscular amaurosis, *J. J. Adams*. Disposition à la fatigue des yeux, *Bonnet*. Kopyopie, *Pétrequin*. Weaksightedness. Incapability of sustaining the accommodation of the eyes to near objects. Gesichtsschwäche, *German*.

By asthenopia is understood that state of vision in which the eyes are unable to sustain continued exercise upon near objects, although the patient, on first viewing such objects, generally sees them distinctly, can employ his sight for any length of time in viewing distant objects, and presents no external appearance of disease in his eyes.

Symptoms.—The patient is unable to continue, for any considerable length of time, to regard small or near objects, as in reading, sewing, and the like; but is obliged, partly from the confusion and obscurity which seem to spread over the objects, partly from a feeling of fatigue in the eyes, to interrupt the exertion. With most patients the attack begins by a sensation of constraint in the eyes, which they sometimes try to get quit of by repeated nictitation. Others complain of a feeling of tension or of weight in the eyes, with heat, lacrymation, and double vision. If the patient persists in using the eyes, notwithstanding the feeling of lassitude and the indistinctness of vision, the effort is attended with heaviness in the head, and pain in the eyeballs, orbits, temples, and forehead. A lady, by whom I was consulted, became deaf, if she persisted in trying to read or sew. The deafness never occurred by itself. She was nervous and debilitated from mental agitation and menorrhagia.

In the open air the patient makes no complaint, being able to discern large and distant objects clearly and without fatigue. When he commences to look at small or near objects, he also sees them in general with perfect distinctness for a certain space of time, till the attack of asthenopia comes on, which it does in different subjects in an hour, half an hour, or even a few minutes.

After the attack does occur, a very short period of rest is, in general, sufficient to recruit the sight, so that the power of perceiving small objects returns, and the patient is in a condition to recommence his employment. When near objects fade away, as it were, from before the asthenopic sight, some patients feel it a sufficient relief to turn their attention to remote objects, which they continue to see perfectly; others find remote objects also to appear confused, and require to shade their eyes till the attack wears off. The most complete relief is, in all cases, obtained by shutting the eyes. During the time that the eyes are shut, some patients perceive ocular spectra of the objects to which they had been attending while their eyes were open, especially if the objects had presented remarkable contrasts of light and dark colours.

As, in asthenopia, the effort necessary for reading, writing, sewing, and the like, cannot be sustained for the ordinary length of time, the patient is unable to pursue with comfort any sedentary occupation, requiring the close inspection of near objects. By persisting in attempts to do so, the attacks of weakness and weariness of the eyes are apt to become more frequent and of longer duration, although we do meet with instances of patients struggling under their occupations for many years, the asthenopia continuing nearly the same as when they first began to experience it. Tailors and sempstresses affected with this disease sometimes manage to continue their employment during the first three or four working days in the week with comparative ease, but in the next two or three days they find their sight so weak, that they can hold out with much difficulty, or are actually forced to drop work. The repose of Sunday restores strength to their eyes, and enables them to resume their occupation on Monday. In some instances the state of asthenopia is so very easily excited, that the patient is never able to apply himself to any trade requiring the ordinary use of sight, or is never able to learn to read. These facts are sufficient to show the serious nature of asthenopia. It is an infirmity much more to be dreaded than many disorders of the eye which, to superficial observation, present a far more formidable appearance.

The symptoms are, in general, altogether subjective. On examination, the membranes of the eye are found to be healthy, the cornea and other dioptric media clear, the pupils lively, and neither immoderately dilated nor contracted. Even at the moment when exertion of the eyes on minute objects has produced the wonted attack, the pupils do not present more than a medium degree of dilatation. In some instances, indeed, the eyes appear dull, languid, and inanimate, having lost the expression of force and intelligence, and acquired one of feebleness and indecision; but in general they show no marked sign of disease.

Asthenopia, in the ordinary run of cases, is unattended by any increased sensibility, intolerance of light, or pain in the organs of vision, unless the patient is in the way of forcing his eyes to continued exertion even during the attack. Then, indeed, pain is felt in the eyes and head. Some patients, however, complain of pain in the upper part of the eyeball, as if it had received a blow, even when their eyes are at rest. Pain down the middle of the forehead is also a symptom which many mention as being almost constantly present.

The tongue is generally clean; sometimes it is tumid, and impressed round the edges by the teeth. The appetite is tolerably good, and the bowels regular. The disease rarely appears to be connected with any disordered state of the digestive organs.

The habit of body of asthenopic patients is generally delicate. Paleness of the face and coldness of the extremities indicate the feebleness of their circulation. We rarely, if ever, meet with the disease in robust or plethoric subjects. On the contrary, those who suffer from asthenopia are, with few exceptions, wan and ill-fed; frequently thin girls, whose bodies are enfeebled and minds depressed by a sedentary life, want of air and exercise, and other causes.

Asthenopia is rarely observed to commence in those who have already reached the middle period of life, but almost exclusively takes its origin in childhood or youth. Commencing at a very early age, it is apt to continue through life.

Females are as frequently the subjects of the disease as males; but it seems very seldom connected with any disorder of menstruation.

Diagnosis.—The vulgar are apt to include every sort of disease of the eye under the term *weak sight;* nor are medical authors free from the error of jumbling a variety of disorders under the same appellation.

The diseases with which asthenopia is most apt to be confounded are photophobia, incipient myopia, presbyopia, night or day blindness, and amblyopia or incomplete amaurosis.

1. *Photophobia.* The photophobia attending inflammation of the conjunctiva, caused by the heat which accompanies strong artificial light, and especially gas-light, is sometimes confounded with asthenopia. The inflammation in question is marked by a hot and irritable state of the eyes, which feel dry and stiff, and at length become painful and itchy, so that the patient is obliged to be continually rubbing them. These symptoms arise from a suppression of the secretion of the conjunctiva; but the disease being unchecked by rest and other means, the conjunctiva becomes much more inflamed, and begins to secrete puriform mucus. The patient, as in asthenopia, is forced to abandon the occupations he had been pursuing; but the slightest attention will enable the practitioner to distinguish the photophobia of this or of any other ophthalmia from asthenopia.

2. *Myopia.* It sometime happens that young persons, about the

age of puberty, after severely trying their eyes upon minute objects, as in painting, embroidering, and the like, suddenly become short-sighted. They and their friends are alarmed at their being no longer able to distinguish objects on the opposite side of the street, which a few days before they saw perfectly. The discerning of small objects is attended with an unusual effort; and, instead of fifteen or twenty inches, at which distance the patient formerly read, the book must be brought as close to the eyes as eight or ten inches. Sudden myopia is most apt to occur in boys sent to learn such trades as watch-making or engraving, or in young ladies at school occupied with music, painting, embroidery, and other pursuits, requiring continued and keen employment of the sight. Suddenly occurring in such subjects, myopia is sometimes taken for amaurosis, but is more apt to be confounded with asthenopia. The application of a concave glass discloses at once the true nature of the case.

3. *Presbyopia.* Those who have become long-sighted can at no time see near objects distinctly, except through convex glasses. In asthenopia the patient sees near objects distinctly for a certain space of time, after which they appear confused and obscure. It is not wonderful that these two conditions should sometimes be confounded. This is especially apt to happen when presbyopia occurs in children, rendering them unable to read at the ordinary distance, except with convex glasses. (See p. 923.) The relief afforded to the asthenopic patient by the employment of such glasses is a circumstance exceedingly apt to cause the two diseases to be mistaken for one another. The diagnosis will be plain, when it is observed, that in asthenopia a short period of rest renews the power of distinguishing near objects, while in presbyopia rest has no effect.

4. *Night-blindness.* The distinctly periodical attacks of night-blindness, and the restoration of sight on the return of day, should sufficiently distinguish that disease from asthenopia.

5. *Amblyopia or incomplete amaurosis.* As it is a maxim in classification, that magnitude affords no specific distinction[1], were asthenopia merely a less degree of amblyopia, they could not with correctness be regarded as distinct diseases. The difference between amblyopia and amaurosis being in degree only, they constitute one species; but between amblyopia or incomplete amaurosis and asthenopia, there is reason to believe that a specific difference exists, and that they involve different parts of the organ of vision.

In amblyopia there is constantly present an indistinctness of sight, extending to all objects, large and small; in asthenopia vision becomes obscure, only after being exerted upon near objects. In amblyopia the patient generally sees best after fixing his eyes, or *steadying* them, as he often terms it, for some time on the object; in asthenopia, it is then only that he begins to see ill.

Asthenopia has often been treated as incipient amaurosis; but there is no necessary connection between the two diseases, nor does the one lead to the other.

Complications.—Pure asthenopia is not uncommon. It then appears as the effect, neither of any previous disease of the eyes, nor of any constitutional ailment implicating these organs. On the other hand, it is by no means uncommon to find asthenopia complicated, either with some other disease of the eye, or with some general disorder of the nervous, or of the circulating, system.

For example, we frequently find asthenopia affecting eyes which still show traces of one or other of the ophthalmiæ, and especially specks of the cornea. In one case I found inflammation of the anterior crystalline capsule combined with asthenopia. Some of the subjects of this disease are myopic; others prematurely presbyopic. The weakness is, in many cases, most troublesome during the use of artificial light, and even approaches to night-blindness in the suddenness of its evening exacerbations, and the degree of imperfect vision which attends it. The disease is often accompanied by muscæ volitantes, sometimes by ocular neuralgia, or oscillation of the eyes, and not unfrequently by strabismus.

Asthenopia generally affects the two eyes pretty equally. If only one eye is affected, and the other good, the disease is apt to pass undetected. One eye being completely amaurotic, or disorganized from injury or otherwise, asthenopia not unfrequently affects the other. It sometimes happens that one eye is incompletely amaurotic, and the other only asthenopic. In general, an incompletely amaurotic eye is free from the characteristic symptom of asthenopia; but, in some instances, we find amblyopia or incomplete amaurosis accompanied by asthenopia. When this is the case, the view of all objects is at all times more or less ambiguous, while an attempt to read or sew is speedily followed by a new degree of indistinctness, and an incapability of continuing the exertion, which incapability a little rest removes. The patient who is so affected is likely to complain of photopsia, and floating or fixed muscæ, and his pupils will be limited and sluggish in their movements.

The consistence of an asthenopic eye is in general normal; but, in some instances, it is too firm, while, in others, the cornea and sclerotica are too flexible, symptoms denoting in the one case a redundancy, and in the other a deficiency, of the vitreous fluid.

Asthenopia is often attended by general debility, and by considerable depression of the powers of the mind as well as those of the body. In such cases the pulse is quick, small, and compressible; and the patient is inanimate, and affected with chilliness. In some the symptoms denote an approach to anæmia. In many the scrofulous diathesis is manifest.

Remote causes.—Having satisfied ourselves by an examination of the symptoms, that the case is one of asthenopia, and having ascertained the degree to which the disease has proceeded, the period of life when it commenced, and the general state of health by which it is attended, our next inquiry should be into its remote cause. To trace the disease correctly to this is of the greatest importance, as it is the remote cause which affords some of the chief therapeutical indications.

1. In many instances asthenopia appears to be an idiopathic disease, resulting entirely from over-exertion of the sight. On inquiry into the history of the case, we find that, previously to exercising the eyes upon minute objects without proper intermission, these

organs were strong and healthy, having either never suffered from any of the ophthalmiæ, or if so, having perfectly recovered; and that, as the patient has laboured under no chronic affection of the general health, there is no reason to regard the weakness of sight as a symptom of any other disorder of the nervous, or of the circulating, system.

Young lads engaged as clerks or book-keepers, or bound apprentices as tailors, watch-makers, pattern-drawers, compositors, or engravers, and young women employed as dress-makers or sempstresses, afford frequent examples of asthenopia from pure abuse of vision. Students, and those engaged in literary pursuits, spending their days, and great part of their nights, in reading and writing, often reduce their sight to such a state of weakness, that it is incapable of sustaining the shortest application to new objects. Individuals whose circumstances relieve them of any necessity to overwork their eyes, who are sober and chaste in their mode of life, and scrupulous observers of the general rules of health, not unfrequently sacrifice their sight to their particular tastes in literature, science, or the fine arts.

Various incidental circumstances seem to aid the influence of overuse of the eyes in producing the impotency constituting the characteristic symptom of the disease; such as working by artificial light, want of the due quantity of sleep, and excessive occupation of the mental faculties.

For various reasons it is always more injurious to the eyes to overwork them on minute objects by artificial than by day-light. This is a topic which has been carefully handled by the late Dr. James Hunter, whose work may be consulted with advantage.[2] He ascribes the injurious effects of artificial light chiefly to the four following causes—viz., 1. The defective chromatic constitution of the rays of artificial light. 2. Their greater heating power in proportion to their illuminating effect. 3. The formation and disengagement of carbonic acid gas during combustion, which, being absorbed by the lungs, causes headach, and acts detrimentally both on the eyes and on the brain and nerves generally. 4. The unsteadiness and the generally disadvantageous position and direction of the artificial light employed.

Want of sleep is sometimes the chief agent in producing the disease, as in night-work of all kinds, and especially in night-study. When not the chief agent, it, in no small degree, aggravates the operation of other causes. Sleep, by suspending the sentient and muscular actions of the organ of vision, repairs its vigour. During sleep the exhausted substance of the brain, nerves, and muscles is renewed by the assimilating process. This repose and renovation being denied, it is inevitable that the powers of the eye must become debilitated. Even in the dark, want of sleep is detrimental to the sight; much more if, amid the glare of artificial light, the eyes are forced on to exertion, in spite of the natural feelings of fatigue. A block-cutter, aged 22, consulted me for asthenopia on the 15th of July, 1843. His complaint arose from being obliged during the preceding winter to work not unfrequently both night and day.

Prolonged investigations with the microscope by artificial light are likely to be a fruitful source of asthenopia, if they do not cause effects still more serious, such as congestion or inflammation of the choroid and retina, and ultimately amaurosis.

What may be called the hot-house education of modern times, is a fruitful source of asthenopia. Nothing is so hurtful to the sight as the combined straining of the eyes and mind, to which young people, and especially girls, are so often subjected at the period of puberty. A boy, twelve years of age, was sent to me by his parents, labouring under asthenopia. He told me, he attended school from 9 A. M. till 4 P. M., with only half an hour's interruption. The whole of his evenings he had been in the habit of spending in the perusal of the volumes of Chambers's Edinburgh Journal, a work printed in small type. The disease had increased rapidly during the three weeks preceding my seeing him. With girls, there is no end the live-long day to instruction of one kind or another—reading, writing, the acquisition of different languages, arithmetic, drawing, needlework, music, &c. Asthenopia appears frequently to arise from practising at the pianoforte, especially by artificial light. If the exhilarating recreation which the eyes, along with the rest of the body, and the mind, should enjoy in the open air is denied, and a young person, at the very period when the process of growth is going on rapidly, is condemned to a perpetual succession of sedentary tiresome occupations, is it to be wondered at that asthenopia should ensue, with paleness, feebleness, and emaciation? The natural development of the system is checked, a congested state of the brain is produced, and the martyred being, crippled in body and mind, but too often falls into incurable disease.

Undue exercise of the sight, while the person is convalescent from some general and acute disease, as influenza, fever, &c., or even from some local disease, which either by itself, or by the treatment necessary for its removal, has produced considerable general debility, and especially much reading in such a state, I have particularly traced as a cause of asthenopia.

2. We frequently find that asthenopia has originated in one or other of the ophthalmiæ, from which the patient had suffered at some previous period of life.

A child is sent to school at the age of six or seven; but it is found that he cannot be taught to read, and he is beaten for a month or two, because, though he sees quite well out of doors, and quite well when he first takes up his book, he cannot continue to read for more than a few minutes. On being brought for medical advice, the symptoms are found to be evidently those of asthenopia. On inquiry, it is stated by the parents, that the child suffered, when a few days old, from purulent ophthalmia, which, being at first neglected, was perhaps not overcome for a couple of months; or, that, when two or three years old, he lay for weeks or months on his face, with sore eyes, unable to bear the least light. In either of these two cases, asthenopia is by no means an uncommon result, although it may not be discovered for several years after the existence of the ophthalmia.

The ophthalmia first referred to, or ophthalmia neonatorum, often extends its influence to the internal parts of the eye. It is extremely likely to do so, if it is either neglected for a number of weeks, or from inefficient treatment is allowed to fall into a chronic state. In some subjects, it leaves a partial opacity of the lens and capsule; in others, an affection of the choroid and retina. These sequelæ are often detected only when the child is sent to school. In the former case, the eyes are myopic; in the latter, they are apt to be presbyopic or amblyopic. In either case, they may in addition be asthenopic. The eyes may also recover from the inflammation, without any affection of the transparent media, or other sequela, except asthenopia.

A fruitful source of asthenopia is to be found in the scrofulous inflammations of the eyes, and especially phlyctenular conjunctivitis. It is well known, that in this disease, not only do serious changes take place in the textures of the eye, but that an obstinate reflex action of the sphincter of the eyelids is excited by the incidence of the light upon the sentient nerves in an irritable state. The asthenopia which follows successive attacks of phlyctenular ophthalmia, may be ascribed partly to the changes produced by inflammation on the internal textures of the eye; partly, and perhaps chiefly, to the long-continued pressure on the eyes by the patient, as he lies with his face on his hands or on the pillow, aided by the action of the eyelids violently closed by spasm. I have already mentioned one instance (p. 486), in which, on the photophobia of scrofulous ophthalmia subsiding, the child, who was the subject of the disease, was discovered to be amaurotic—a result which I incline to ascribe to the pressure so long exercised on the eyes. To the same cause may, in some measure, be attributed the impeded growth of the eyes, which attends a long-continued attack, as well as such changes in texture as leave the patient in some instances amblyopic, and in other asthenopic. A girl was brought to me, with a small speck on each cornea, the result of scrofulous ophthalmia in infancy. She was now sixteen years of age, and affected with such a degree of asthenopia, that although she saw the smallest objects, she had never been able to learn to read. In cases of this sort, sometimes only one eye is affected with asthenopia; more frequently, both. The fear of so serious a consequence, makes it important to cure phlyctenular ophthalmia as speedily and perfectly as possible.

It is not the ophthalmiæ of childhood alone which give rise to asthenopia. This result may follow any of the inflammations of the eye.

If the patient states that his weakness of sight was preceded by a frequent flashing of fire in his eyes, intolerance of light, and epiphora, with pain deep in the eyeballs, and extending from the eyes to the occiput, and that these symptoms were increased on stooping, or on straining in any way; or if his weakness of sight is still attended by these signs, along with muscæ volitantes, irregular pupils, and hardness of the eyes, there is reason to conclude that congestion or inflammation of the choroid has existed, or still continues to exist in a chronic state.

If similar symptoms have been attended by a shifting of the pupil to one side, along with manifest thickening, or subsequent thinning, of the sclerotica, the asthenopia is a result of scrofulous sclerotitis.

If the pupil be contracted, imperfectly moveable, and fringed with lymph, or with projecting particles of pigment, and the iris discoloured and bolstered forward towards the cornea, iritis or retinitis has been the cause.

If, on viewing the pupil through a lens of short focus, red vessels are descried ramifying on the anterior capsule of the lens, the asthenopia has originated in crystallinitis.

If the patient is myopic, the cornea hazy, and the eye hydrophthalmic, corneitis has been the cause.

Such names as corneitis, iritis, &c., denote merely the chief seat or focus of certain ophthalmiæ, each of which affects more or less the whole textures of the eyeball, internal as well as external, and any one of which may lay the foundation of asthenopia.

3. Injuries of the eye, and still more readily injuries of the branches of the fifth nerve round the orbit, are apt to give rise to asthenopia. A large proportion of the patients who have come under my notice with this disease, have presented cicatrices in the eyebrow or in the skin of the forehead; and many of them have been able to state, that, till they had received the wound leaving the scar, their sight had been strong. The irritation or inflammation of the injured eye, or injured branch of the fifth nerve, in such cases, may be supposed to be propagated along the optic nerve or along the trunk of the fifth nerve to the brain, and a reflex affection to be produced, implicating the third nerve, the optic nerve, or both.

4. Asthenopia is often traceable to affections of the encephalon.

The irritation of the brain in teething children, so frequently productive of convulsions, appears in many instances to be the cause of asthenopia.

A boy, of thirteen years of age, was brought to me with asthenopia and presbyopia. When six years old he was very ill with measles, and lay insensible for some days. This was the origin of the affection of his eyes.

Another patient dated his weakness of sight to inflammation of the brain, when he was nineteen years of age. Another traced it to nervousness, produced by a fright.

A gentleman, aged sixty, who came under my care with slight hemiplegia, as this subsided, found himself asthenopic. He saw the figures in some small prints which hung in his room, and all other distant objects, quite distinctly. He could read a line or so with the aid of his convex glasses, but no more. The letters seemed to him as if they began to tremble, and get mixed, so that he was obliged to desist.

Many asthenopic patients have consulted me, whose heads were hydrocephaliform, and some of them considerably above the normal size. Tubercular disease of the brain is probably a cause in some instances.

I have known typhus fever, and malignant cholera, by implicating the brain, prove causes of asthenopia.

5. If asthenopia is attended by a heavy, sunk appearance of the eyes; if they present a dark circle round them, and feel hot to the touch; if the patient has a melancholy expression, with an air of absence and timidity; if he answers questions with hesitation; if he complains of pain and feebleness in the back and limbs, and inability to undergo ordinary bodily fatigue; these are strong grounds to suspect the cause of all his symptoms to be some abuse or disorder of the generative system, such as excessive venery, masturbation, or spermatorrhœa. Under such circumstances, it may be proper to suggest to the patient the possibility of his disease being connected with the generative system. This will perhaps call forth a declaration, that at no time has he suffered from venereal disease in any shape, along with a confession that he may have given cause for some weakness in the generative organs, and that for some time he has suspected that such was the case.

I have often ascertained, that asthenopia, in young men, is a result of excessive venereal indulgence, but more frequently still, of masturbation, or of involuntary emissions. I have no doubt, that masturbation is a frequent cause of the same complaint in females.[3]

Pauli relates[4] the case of two sisters, the one 28 and the other 23 years old, both of whom, from masturbation, brought on asthenopia, with melancholy and great debility. Along with other symptoms, he mentions a habit of constantly biting their nails, a trick to which masturbators are particularly attached, and a repugnance to marriage, which is also characteristic of the class. Females, affected with asthenopia, often labour under leucorrhœa; and this, as well as barrenness, is in many cases a consequence of abuse of the generative organs.

I shall not insist on other causes to which asthenopia appears occasionally to owe its origin. I may merely mention the following as deserving attention; — congenital imperfection in the organs of vision, a bent position of the body during work, dyspepsia, constipation, agitation, grief, and the use of alcohol, opium, or tobacco — poisons which tend to blunt all our sensitive and motive powers. Debilitating influences of every kind are apt to aggravate, if not to induce, asthenopia. A young lady, for whom I was consulted, was much worse after sea-sickness, which brought on a violent attack of hæmatemesis.

Proximate cause. — As pathological anatomy has thrown no light on the seat or nature of asthenopia, we are left altogether to conjecture, respecting its proximate cause.

That there is no considerable change of structure in the retina, no atrophy of that part, as St. Yves imagined[5], is manifest from the fact, that the power of vision is not permanently impaired in this disease. The minutest objects are seen, for a time, as clearly as in the natural state of the eye.

That the sole, or even the chief, seat of asthenopia is the retina, is improbable; that it is in part the seat of it, scarcely can be doubted. In reading, writing, and the similar occupations during which asthenopia is apt to occur, the objects to be viewed are small, the eyes are intensely employed, the pupils converged towards the same point, and the images of objects received on the very vertices of the retinæ. It follows, that the thin portion, within the limbus luteus, is the part of the retina implicated in asthenopia. In viewing distant objects, a larger field of the retina is employed, it is impressed by a variety of forms, and relieved rather than exhausted by the diversity of colour, and the contrasts of light and shade. In such exercise of light, an attack of asthenopia never happens:—

> " All day the vacant eye without fatigue
> Strays o'er the heaven and earth; but long intent
> On microscopic arts, its vigour fails."

That asthenopia is not wholly an affection of the apparatus by which the eye is adjusted to the vision of near objects, but partly involves the retina, is evident from the fact, that when the eye is fatigued in asthenopia, the patient cannot see distinctly or with comfort through a small aperture, and that cases of this disease occur in combination with myopia, or with presbyopia. Were it entirely a disease of the apparatus of accommodation, looking through a small aperture, by rendering the use of the accommodating power unnecessary for the time, would make vision distinct.[6] In myopia, the form of the refractive parts of the eye renders it permanently adapted to see near objects; and yet those who are short-sighted are liable to asthenopia. Patients labouring under the combination of presbyopia and asthenopia, by the use of convex glasses render the action of the adjusting organs unnecessary, yet are not exempt, while using their glasses, from the attack of weak-sightedness.

To say that asthenopia consists in fatigue or weariness of the retina, is to say nothing, unless we were prepared to explain the physiology of fatigue—the anatomical change which a sentient nerve undergoes, when it has been too long wrought or over-excited. That a nerve, in this condition, becomes incapable of being accurately impressed, or of accurately conveying impressions to the sensorium, is well known; but how this impotency arises, whether the circulation of the blood through the nervous structures fails, or the imponderable agent of nervous power becomes exhausted, or the vibrations of the nervous elements cease, we cannot tell, being equally ignorant of the nature of nervous action in health, and of its failure under weakness or fatigue.

The eye, in its normal state, possesses a power of adjustment, by which it is enabled to bring to focal points on the retina the diverging rays proceeding from near objects, as well as the parallel rays proceeding from objects which are remote. Wherever the change resides, by which the refraction effected by the eye being increased, its focal distance is shortened, and it is adapted to the vision of near objects, it is plain that the asthenopic eye is not entirely deprived of the power of effecting that change; for on first looking at near objects, the patient sees them perfectly, and continues to do so till the attack comes on. He then loses sight of near objects, and becomes presbyopic. His vision of distant objects continues distinct, but his eye refuses to sustain the effort necessary for bringing the rays of light, arising from objects within a certain distance, to focal points on the retina. The organ or organs of adjustment, then, are affected in this disease; and are probably the chief seat of the complaint.

A hypothesis which I have formed on the subject of adjustment is, that the iris and the ciliary processes are antagonists; so that when the pupil contracts, as it always does on our directing the eyes to near objects, the ciliary circle, by the influence of its muscle, expands; and when we look at distant objects the pupil expands, and the ciliary circle contracts around the lens.[7] On the ciliary circle expanding, the crystalline will be allowed to advance towards the pupil, so as to assist in shortening the focal length of the eye; on its contracting, the crystalline will again retire towards the retina. These changes may be accompanied by a change of figure of the crystalline, its axis becoming elongated when it advances in the eye, and shortened as it retires. Nor is it improbable that the contraction of the straight and oblique muscles, while it tends both to elongate the axis of the eye, and shorten the radius of curvature of the cornea, aids the advance of the crystalline.

The motions of the ciliary muscle and of the iris, as well as those of the straight and oblique muscles, are under the influence of the third nerve; and if deprived by any cause, of their usual nervous stimulus, their motions must be impeded, and the function of adjustment be imperfectly performed. This is the case in asthenopia. On exposing an asthenopic eye to various degrees of light, the motions of its pupil may be as vivid and extensive as those of a healthy eye. On first being turned towards a near object, the pupil may also be observed to contract; but if we watch the eye, applied seriously to the continued vision of a near object, as in reading, the pupil will be seen, in general, to fall into a medium state of dilatation, and not to maintain its state of contraction, as would the pupil of a sound eye under the same circumstances. The ciliary circle probably assumes also a medium degree of expansion. This state of parts may be deemed sufficient to produce almost the whole symptoms of the disease. The effort necessary for adjustment cannot be sustained, the focal length of the eye can no longer be shortened as it should be, the letters of the book fade from before the sight, and the feeling of fatigue creeps over the eye. It is probable that the cause of this weakness resides, not in the ciliary nerves merely, nor in the parts to which they are distributed, but in the third nerve, and the other muscular nerves of the eye, generally. The contraction of the recti and obliqui, then, so necessary for keeping the eye in the state of libration, for directing it along the lines of the printed page, for converging the eyes to the same point, and perhaps for compressing the globe of the eye, so as to maintain an increased distance between the retina and the cornea, must, in this case, gradually give way under the effort demanded, so that these muscles fall into a state of minimum contraction. The consequence is, that at length the upper eyelid drops, and the patient is obliged to indulge in that cessation from visual exertion which experience has taught him will renovate his exhausted powers of sight, and enable him by-and-bye to resume his labour.

Prognosis. — The prognosis in asthenopia is, on the whole, unfavourable. If the disease has lasted for a number of years, and especially if, besides, it has originated in one of the ophthalmiæ, in an injury of one of the branches of the fifth nerve, or in some affection of the encephalon, it is rarely benefitted by any sort of treatment.

In cases of recent date, much depends on the practitioner's detecting the remote cause, and on the patient's power of abstracting himself from its influence. This refers principally to the first and fifth of the remote causes already considered.

As far as my experience goes, asthenopia has very little tendency to wear itself out.

If the disease is connected with plethora or local congestion, the prognosis is better; but if the patient is much debilitated, or of a scrofulous constitution, it is very unfavourable.

When a certain degree of asthenopia, more or less in different subjects, has continued for several years, so that it may be regarded as confirmed, it seldom gets worse, and very rarely passes into amblyopia or amaurosis. The medical cautions which the patient receives contribute, no doubt, if attended to, to prevent his disease from gaining ground, or amaurosis from supervening. We may safely, then, to the question so often put to us, whether the disease is likely to end in blindness, answer in the negative; and I conceive it to be no small matter, that we are able to do so on good grounds. This is a point of great importanec, depending however entirely on the accuracy of our diagnosis of asthenopia from incipient or incomplete amaurosis. A lady consulted me respecting her eyes, which were asthenopic. After I had explained to her the necessity of giving her eyes rest, and assured her that the disease, although probably incurable, would not end in the loss of sight, she informed me that she had returned from India on account of the affection of her eyes; that her medical attendant there had pronounced it to be amaurosis; and that she was greatly alarmed lest she should become blind. Her mind was much relieved when I explained to her that the disease was not amaurosis, and advised her to return to her family in India, which I afterwards learned she did.

In many cases it is our duty to declare the disease incurable, and to explain to the patient and his friends, that all that can be done for it is, as much as possible, to spare the sight from exercise on near objects. If the patient is a young lad, bound apprentice to a sedentary trade, and the disease, from its duration and its mode of origin, not likely to yield to treatment, we may advise him to turn shopkeeper, to apply himself to country work, or to go to sea; if a female, occupied constantly in sewing, to engage in household affairs, or any other healthy active employment. Many a poor man have I told to give up his sedentary trade, and drive a horse and cart; while to those in better circumstances, and not far advanced in life, I have recommended emigration, telling them, that, though they never could employ their eyes advantageously where much reading or writing was required, they might see sufficiently to follow the pastoral pursuits of an Australian colonist.

Too often it happens that such advice cannot be followed, circumstances being such, that the patient must either continue the sedentary employment which keeps up the disease, or starve. It is of the greatest importance for him, however, to moderate his application. Without this there is certainly no cure. All other remedies, without rest to the eyes, will be fruitless.

Prevention. — With regard to the prevention of asthenopia, it may be remarked, in general, that the remote causes are carefully to be avoided. Those who, hitherto with impunity, have been exposed to one or other of the remote causes, should be particularly guarded in tempting the injurious influences of the rest. Thus, children who have suffered from scrofulous ophthalmia, if put to a trade requiring earnest application of the sight, are very liable to become asthenopic.

It is impossible to limit the time during which healthy eyes may be employed with safety upon minute objects, as there is a great variety in their power of bearing fatigue. The sight may be regarded as fatigued, whenever the person finds that he requires to bring the object nearer to his eyes than usual; whenever the object appears confused; whenever the eyeball or eyelids become red, or the eyes feel heavy, hot, or affected with a pricking sensation, or with a flow of tears. The moment such symptoms are experienced, the person should rise from his work; relieve his eyes by turning them on distant objects; bathe them with cold water; and, if circumstances permit, expose them to the external air.

Giving the eyes even a few minutes' occasional rest is of great service in preventing them from becoming weak, especially when employed in such exhausting occupations as reading, writing, drawing, engraving, sewing, and the like. As important means of preserving the sight from weakness may be mentioned, shifting the occupation from a fatiguing one to one requiring a less earnest use of the eyes; turning away from the light, if it is brilliant, or closing the eyes for a few minutes; changing the bent position of the body for the erect, and, in place of sitting still, walking about for a little; and avoiding everything tight about the body, as tight neckcloths, stays, and even shoes, so as to allow a free and equable circulation of the blood. The eyes should never be forced to continued exertion. The eyes of children especially should never be fatigued. They should never be allowed to read books printed in a small type.

Treatment.—1. *Avoidance of the remote causes.* As a general principle, the patient must endeavour to desist from everything which weakens the nervous system, or exhausts the organ of vision. If he annot altogether abandon the employing of his eyes upon minute bjects, he must, at least, allow them the necessary periods of relaxation, and, if possible, choose for his amusements such as may lead him to the extended prospects and refreshing verdure of the country. If confinement within doors be the cause, this must be changed for some active employment. Bad practices must be abandoned, and every particular be studied which is likely to fortify the constitution. Perpetual exercise in the open fields should be substituted for the monotonous restrictions of a town life, and a hard bed and early rising for the enervating contrivances of luxury and indolence.

2. *Rest of the eyes.* The patient ought never to work long without giving his eyes rest; and ought to avoid as much as possible the fixing of them on any minute objects.

"Supposing a patient could work for an hour," says Mr. Tyrrell, "but not longer, without producing disturbance of vision, he should then be directed to work for half an hour at a time; and to allow intervals of rest, of a quarter of an hour each: he can thus work for two-thirds of his usual time, while his cure proceeds. * * * The period allowed for employment should be short of that in which application produces the disturbance of vision; and the time devoted for resting the eyes should never be less than a quarter of an hour. Supposing that the impaired vision occur within half an hour, or less, after the eyes have been employed at work, it is best for the patient to refrain from work altogether for a week or two, until the affection be mitigated."[8]

Although the abstaining from such employments as require the eyes to be exercised for any considerable length of time on small objects is one of the most evident indications in asthenopia, and without which any other means of cure are likely to prove fruitless, yet I fear that the hopes of curing the disease by rest alone will prove delusive, unless in incipient cases, arising solely from over-use of the sight.

We must be aware, too, of deceiving ourselves regarding the effects of other remedies used during the observance of rest. The good effects which they may seem to produce will often prove nothing else than the restoration which always takes place during repose. Whether it is so or not will readily be ascertained on the very first application of the eyes to minute objects.

3. *Depletion.* The reduction of vascular action by blood-letting or leeching is very rarely indicated in asthenopia, and ought to be had recourse to only when the patient is robust, and the disease attended by signs of local congestion.

4. *Purgatives.* Constipation frequently accompanies asthenopia, and is likely to aggravate the affection of the eyes. A course of purgatives is often attended by remarkably good effects, and laxatives in such cases ought to be continued regularly in moderate doses.

5. *Alteratives.* A deranged state of the digestive system, and a faulty secretion from the liver, if not remedied by ordinary purgatives, may require small doses of some mild preparation of mercury.

6. *Tonics.* On the presumption that asthenopia is a disease of debility, tonics chiefly are employed for its cure, and especially the preparations of cinchona and of iron. Sulphate of quina and the solution of the oxy-sulphate of iron are among the most effectual. I have known many cases greatly relieved by these means. Sulphate of zinc, from its peculiar influence on the nervous tissue, presumed by some to be similar to that of iron on the blood, seems likely to be of great service in asthenopia. I have known a perfect cure effected under a course of cod-liver oil. In proportion as the patient gains strength, and the action of the nervous system is improved, the power of vision is invigorated. Change of air and scene, by its exhilarating effect, will often prove the best tonic.

7. *Diet.* In general the quantity of the patient's food requires to be increased, and its quality improved. Nutritive animal food of easy digestion should be given. The patient may drink water freely, but use alcohol in no form, unless it is prescribed as a medicine.

8. *Tepid and cold bathing.* The cold bath, and especially a course of sea-bathing, I regard as one of the most efficacious means of cure. It is not, however, always safe to commence so energetic a remedy all at once; it is better to try tepid and cold sponging, followed by careful friction, before plunging into cold water, whether fresh or salt.

9. *Sedatives.* The only internal medicine of this kind I have tried is belladonna. I have employed it frequently in the form of tincture. It lessens the disposition to fatigue in the eyes in a very remarkable degree. It also diminishes the tendency to seminal discharges. The dose is from five to fifteen drops thrice a day. Aconite, which so much alleviates nervous headache, seems worthy of a trial in asthenopia. Such medicines should be had recourse to only when the disease is accompanied by pain and irritation.

10. *Stimulants.* The tincture of nux vomica is the only remedy of this class which I have found useful in this disease. Any signs of congestion will forbid the employment of this medicine.

11. *Cold and warm lotions.* Temporary benefit is obtained by bathing the eyelids with cold water, water acidulated with vinegar, a mixture of a small quantity of sulphuric ether or sweet spirits of nitre with water, or the like. The subtraction of heat which follows such applications greatly relieves the feeling of fatigue in the eyes. Fomenting the eyelids with warm water, chamomile tea, poppy decoction, and other warm fluids, also affords temporary relief, and may be used when the weather is cold.

12. *Cold douche.* Beer invented an eye fountain, by which a small stream of cold water was made to play upon the closed eyelids, and which he recommended to be used frequently during the day. Jüngken uses water, impregnated with carbonic acid gas, in the same way. Romberg has applied a jet of pure carbonic acid gas to the eyes with good effect.

13. *Spirituous and aromatic vapours.* Exposing the eyes to stimulating vapours, such as that of aqua ammoniæ, sulphuric ether, or a mixture of these, sometimes proves useful. The fluid selected may be poured into a small cup, previously warmed by being placed a few minutes in boiling water, and the cup held under the eye, so that the vapour may rise into contact with the conjunctiva. This should be continued till the eyes begin to water and become red, and repeated twice or thrice daily. Wenzel objects to the use of ammonia, and the like, in this way, and recommends the eyes to be fumigated with the vapour arising from aromatic resins, thrown upon a live coal.

14. *Counter-irritation.* In cerebral cases, and in cases complicated with congestion of the choroid, blisters to the temples, behind the ears, and to the back of the head, prove useful.

15. *Cauterization of the urethra.* When asthenopia depends on obstinate spermatorrhœa, or on masturbation, advantage may be derived from the application of lunar caustic to that part of the urethra which receives the ejaculatory ducts.[9] Spermatorrhœa appears to be kept up by a chronic inflammation of that part of the urethra, which inflammation the caustic removes. The same remedy renders masturbation painful, so that its repetition is prevented, and the habit broken.

The length of the urethra is to be measured with the catheter. By means of Lallemand's *porte-caustique,* the caustic is then to be applied for an instant to the surface of the verumontanum, immediately anterior to the prostatic portion of the urethra, and the instrument withdrawn closed. This is to be followed by low diet, diluent drinks, and the hip-bath. The inflammation caused by the caustic subsides in about ten days, and then the amendment begins to be perceived. The spermatic discharges becoming fewer, the patient gains strength; and among other signs of improvement, he finds his sight restored to its normal power of sustaining fatigue.

16. *Convex Glasses.* Few patients, not even those of them who are mere children, continue to be long affected with asthenopia, without making use of convex glasses. One of the strongest proofs that the seat of the disease must be, in part at least, the apparatus of accommodation, is the fact that the employment of such glasses relieves the symptoms almost as completely as it does those of presbyopia. The only danger is, that the patient begins with glasses of too short a focus, so that, when age advances, he finds he has forestalled the advantage he might otherwise have derived from glasses adapted to an increasing long-sightedness. I have often been consulted by individuals under 20 years of age, who, on account of asthenopia, were using convex glasses of as short a focus as eight or even six inches.

A child, the subject of asthenopia, engaged in learning his lesson, complains he cannot see, and repeats the complaint so frequently, especially by candle-light, that his father or grandfather at last says, "Try my glasses!" The child now sees perfectly, and night after night the loan of the glasses is required before his task can be finished. It would have been better had glasses been selected of the longest focus, which would have enabled the child to read, or better still had he been put to bed, and the lesson left till day-light.

If we are consulted in time as to the use of convex glasses for asthenopia, all the advice we can give is, to choose those of the longest focus, which will answer the purpose wanted. They serve merely as a palliative, but a palliative of great importance to those who but for their aid could not win their bread. They seem to have no effect in removing, neither do they appear, in general, to confirm or aggravate the disease, if properly selected. A young gentleman, however, engaged in learning the profession of the law, having by the advice of an eminent oculist had recourse in this disease to the use of convex glasses, and used them for some years, assured me he found his sight getting weaker and weaker, till he threw the glasses aside, after which without anything else being done, he found a considerable improvement to take place.

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[1] Linnæi Philosophia Botanica; § 260. p. 206; Viennæ, 1755.

[2] On the Influence of Artificial Light in causing Impaired Vision; Edinburgh, 1840.

[3] "Les femmes sont également enclines à ces mauvaises habitudes." Berton, Traité Pratîque des Maladies des Enfants, p. 800, Paris, 1842. "Cette malheureuse passion amène exactement les mêmes resultats dans l'autre sexe à tous les ages." Lallemand, Des Partes Séminales Involontaires; Tome iii. p. 207; Paris, 1842.

[4] Ammon's Monatsschrift für Medicin; Band i. p. 592; Leipzig, 1838.

[5] Nouveau Traité des Maladies des Yeux, p. 334; Paris, 1722.

[6] Porterfield's Treatise on the Eye; Vol. i. p. 395; Edinburgh, 1759.

[7] Medical Gazette; Vol. xiii. p. 631; London, 1834: Physiology of Vision, p. 185; London, 1841.

[8] Practical Work on the Diseases of the Eye; Vol. ii. p. 30; London, 1840.

[9] Lallemand, Op. cit.; Tome iii. p. 392: Phillips, Medical Gazette; Vol. xxx. p. 587; London, 1843.

SECTION XII.—NIGHT-BLINDNESS.

Syn.—Nocturnal amaurosis. Moon-blindness. Nyctalopia of some, and hemeralopia of others; terms which it were better altogether to avoid. Nyctalopia, more especially, has been used to signify both *seeing by night*, and *night-blindness.* Sometimes even the same author uses the word in both these opposite meanings. It seems doubtful whether it is a compound of νὺξ and ὤψ merely, or of νὺξ, *α privative*, and ὤψ; and a similar doubt hangs over hemeralopia.

Case 869.—As the servant to a corn-miller was employed, one evening near sunset, in mending some sacks, he felt himself suddenly deprived of the use of his limbs and of his sight. At the time he was attacked by this uncommon disease, he was not only entirely free from any pain in his head or limbs, but had even a sensation of ease and pleasure; he was, as he expressed himself, as if in a pleasing doze, but perfectly sensible. He was immediately carried to bed, and watched till midnight; at which time he desired those who attended him to leave him, because he was neither sick nor in pain. He continued the whole night totally blind, and without a wink of sleep. When the daylight of the next morning appeared, his sight returned to him gradually, as the light of the sun increased, till it became as perfect as ever. When he rose from his bed, he found his limbs restored to their usual strength and usefulness, and himself in perfect health.

But on the evening of the same day, about sunset, he began to see but obscurely, his sight gradually departed from him, and he became as blind as on the preceding night; though his limbs continued as well as in perfect health, nor had he, from the first night, any farther complaint from that quarter. Next day, with the rising sun, his sight returned; and this was the almost constant course of the disease for two months.

The symptoms which, from the second night, constantly preceded the blindness, were, a slight pain over the eyes, and a noise in his head. That he was totally blind every night, when these symptoms appeared, was evident from his not being able to see the light of a candle, though held close to his eyes; and that in the day his sight was perfect, was as manifest, from his being capable of reading the smallest print, and threading the finest needle.

The first day that Dr. Pye saw this patient, he found his eyes perfectly natural; but some time after, he observed the pupils, during one of the nocturnal paroxysms, to be enlarged about one-third beyond their natural diameter. After nearly two months' continuance of the disease, it began to be less regular in its occurrence, the patient retaining his sight for a single night, or for several nights together, and then the blindness recurring. Dr. Pye put him at last on the use of cinchona, and thought it successful in removing the complaint. It must be observed, however, that the patient, while taking the cinchona, laboured under a spontaneous diarrhœa, in consequence of which he became gradually weaker and weaker. His sight he retained from the first day after using the medicine; but ten days after, he became delirious and deprived of hearing, and, in five days more, he died.[1]

I have quoted this case, as a good example of night-blindness, a disease which, though rare in this country, is by no means uncommon in warm climates, and to which seamen appear to be particularly exposed.

Symptoms.—The first attack of the disease generally excites great alarm. The patient is busy perhaps at his occupation, or enjoying himself in the midst of his family, when suddenly he finds his sight fail, and as evening advances becomes almost completely blind. The medical attendant is immediately sent for, and is often as much amazed, and little less alarmed than the patient. He probably finds the pupils dilated, but no vertigo, pain, nor other sign indicative of any serious affection of the head. He perhaps takes away blood, orders some purgative medicine, and pronounces a very unfavourable prognosis. To the joy of all concerned, the patient wakes in the morning with his sight perfectly restored.

But again on the approach of evening, symptoms are perceived of returning blindness. Objects appear as if covered by a bluish or greyish mist, and in the course of a few minutes the patient is obliged to grope his way like a blind man. Candles are brought. If he perceives that they are present, they appear as if glimmering through a fog, and scarcely ever enable him to see with distinctness. The effect, however, of artificial light is not uniformly the same in this disease. Sometimes, the patient has recourse to a trial of various sorts of glasses, but without avail.

Night after night, the blindness returns, and becomes more and more complete. For a time, the restoration to vision through the day appears to be tolerably perfect, but at length the sight is evidently weak by day as well as by night. The patient is affected with photophobia, and becomes near-sighted; his vision is more and more impaired; and, if neglected or mistreated, the disease ends in incurable amaurosis.

It sometimes happens, in incipient cases of night-blindness, that the patient, though unable to distinguish even large objects after sunset or by moonlight, is restored to a tolerable degree of sight by the use of candle-light; but in cases fully developed, even strong artificial illumination is unable to affect in any degree the sunken sensibility of the retina.

The appearances of the eyes are different in different cases. In many, there is scarcely any change from the appearances of perfect health. Generally, however, the pupils are dilated during the attack, and do not contract on exposing the eyes to the light of a candle or of the moon. In some, the pupils continue dilated even during the day; in others, they are contracted, and evince a painful irritability on exposure to strong light. If the patient happens to look at the direct rays of the sun, especially of a tropical sun, or a strong glaring reflection of them, as from the sea, pain and temporary blindness are induced, from which he recovers by closing his eyes for a time, and retiring into the shade.

Night-blindness does not appear to be necessarily accompanied by any constitutional symptoms. That such symptoms are occasionally present, is evident from the case already quoted, and that a variety of them may attend in other instances, will appear extremely probable from a consideration of the remote causes of the disease.

Epidemic.—Night-blindness became epidemic in two battalions of the 19th Prussian regiment of the line, quartered at Ehrenbreitstein and Pfaffendorf, in July and August, 1834, and attacked, in all, 138 soldiers. When the disease first broke out, those affected were thought to be malingering; but a close examination of the symptoms, and the further spreading of the malady, proved the incorrectness of this suspicion. Those who suffered were unable to find their muskets if they for a moment laid them out of their hands at night; and they experienced so much difficulty in distinguishing even near objects in the dark, that, when they were posted as sentinels, they feared to pace up and down, lest they might not be able to find their sentry-box again. When ordered to march or perform any military evolution during the night, they were constantly stumbling, and knocking against each other, in a manner that could be accounted for only by a defect of vision. In none did the general health appear in the least deranged, and in none could any morbid alteration be detected in the eye. The only thing complained of was a dimness of vision as the twilight of evening came on, and which increased as the night advanced. This dimness the patients compared to that caused by a film spread over the eye.

Hübner investigated this epidemic, and attributed its origin to the following causes:—1. The great heat of the summer. 2. The fatigue experienced by the soldiers in the frequent ascent of the heights of Ehrenbreitstein and Pfaffendorf; a fatigue the more sensibly felt on account of their being all natives of Posen, which is a flat country. 3. The frequency of their exercises and parades, on an unshaded and dazzling sandy soil, where also they were exposed to the reflection of the sun's rays from the surface of the Rhine. 4. The extreme darkness of their rooms, which rendered their eyes more sensible when they went out on duty, or for pleasure. The second and fourth causes were probably the most efficient; for two other companies of the same battalions, quartered in the neighbouring valley of Ehrenbreitstein, entirely escaped the disease. Their barrack-rooms were large and well-lighted, compared with the small, dark apartments in the fortifications where the companies affected with the disease were lodged.

The treatment was very simple, and consisted in removing those affected to an hospital in other quarters, where they were no longer exposed to the operation of the exciting causes; and in the application, generally and topically, of cooling remedies, calculated to diminish congestion. To effect this, cold lotions, frequently applied, low diet, and rest, were sufficient. In the space of four weeks they had all recovered, and were enabled to resume their duty. There were no relapses; a fact accounted for by the diminished intensity of the exciting causes during the month of September.[2]

Fleury and Frechier have given a description of an epidemic night-blindness which occurred in the district of Maussane. Pregnant women were most affected with it, yet no age or sex was spared. The degree of blindness differed much in different individuals. In some it amounted to only a weakness of sight, coming on after sunset; while others became almost entirely blind as night advanced, although their sight had been perfectly good during the day. In a few instances, the eyes continued very weak even during the day.[3]

Prognosis.—The duration of the disease, when it is left to itself, has been found to vary from one night to nine months. Its general period of continuance appears to be from two to three months. Sometimes it occurs in a chronic form, lasting for years, or for life.

Mr. Bampfield states[4] that of more than a hundred cases of idiopathic, and two hundred of symptomatic night-blindness, which had occurred in his practice, in different parts of the globe, but chiefly in the East Indies, all perfectly recovered. Hence he infers that, under proper treatment, the prognosis may be always favourable.

Europeans who have once been affected with night-blindness, in the East or West Indies, are particularly liable to a recurrence of the disease, so long as they remain in a tropical climate. Those who have suffered from it at some previous time, are also apt to be occasionally attacked with dimness of sight during short periods for some nights together, or with merely momentary night-blindness.

Proximate Cause.—This periodic amaurosis probably depends on some peculiar state of the retina, rendering the eye insensible except to light of a certain degree of intensity; but of the nature of that peculiar state it is impossible for us to form any rational hypothesis. On dissecting the eye of a deaf and dumb person, congenitally affected with night-blindness, I saw numerous black spots in the substance of the retina, corresponding to the appearance of melanosis retinæ described by Langenbeck[5], and figured by Ammon.[6] In some cases, there is reason to suspect that the proximate cause does not affect the eye, but the brain.

Remote Causes.—1. Incomplete night-blindness is not unfrequently congenital.

2. Scarpa is of opinion that night-blindness is most frequently connected with disorder of the stomach. When this is the case, the tongue is foul, the breath fœtid, and the appetite deficient.

3. Suppressed perspiration, owing to the coldness of the night air, has been mentioned as a probable cause.

4. Exposure to an unusual glare of light has been known to induce night-blindness, even in this country; and in warm climates, this cause frequently operates in its production. Fatigue and want of sleep appear to act as causes among the Russian peasantry, at a season when the eye is exposed with little intermission to the constant action of the light, the sun in the end of June and during July (their hay harvest) dipping but very little below the horizon, and that only for a short time. Insolation, and in particular sleeping with the face or head exposed to the rays of the sun, or to a very strong light, have been particularly mentioned as causes. De Servières records[7] a case, in which fixedly looking at the rising sun produced an attack of night-blindness which lasted a month, and then gradually subsided without any remedy.

5. A residence on board ship seems of itself to conduce to the disease.[8] Almost all the cases I have seen were in young seamen, who had returned from voyages to tropical climates. Sleeping on deck is blamed as a cause.

6. Some authors have considered night-blindness as a symptom or as a precursor of scurvy. Subsistence upon sea-diet perhaps favours the one, as it certainly induces the other.

7. It is a popular notion in the East Indies, that the eating of hot rice brings on night-blindness.

8. Mr. Cane has published[9] cases, which go to prove that this disease is caused by onanism, spermatorrhœa, and inordinate venery.

Treatment.—1. If there are signs of deranged digestion, an emetic is certainly indicated; after which the bowels are to be cleared out by laxative clysters, and the use of purgatives.

2. The Russian peasants are said to cure this disease, in a week, or 14 days at most, by drinking a decoction or infusion of the centaurea cyanus, without sweetening. Probably other bitter infusions might answer as well.

3. A succession of blisters to the temples, tolerably close to the

external canthus of the eye, has been strongly recommended by Mr. Bampfield. He states that, under their application, the retina appears to regain its sensibility in the same gradual manner as it had been deprived of it; that the first blister commonly enables the patient to see dimly by candle-light, or to perceive objects without being able to discriminate what they are; that in some slight cases, the first blister effects a cure; that the second blister commonly enables the patient to see distinctly by candle-light, perhaps by bright moon-light, or even half an hour after sunset, or that the disease intermits for short periods during the night; and that a perfect recovery is often effected by the second blister. When this does not happen, a third, fourth, or fifth is to be applied; and if the disease still continues in any considerable degree, a perpetual blister is to be formed on each temple, and maintained till a cure is accomplished, which generally takes place within a fortnight.

4. If the night-blindness is attended with symptoms of scurvy, the use of blisters should be deferred, until the scorbutic disposition is corrected, by proper diet and medicines; not only because well-founded apprehensions ought to be entertained of a scorbutic ulcer forming on the blistered parts, but because the night-blindness gradually yields as the cure of the scurvy proceeds. Mr. Bampfield, however, reckons, that about a third of the cases of scorbutic night-blindness resist the antiscorbutic regimen and remedies, and require to be treated ultimately as idiopathic cases.

5. A shade should be worn over the eyes, both during the treatment, and for some time after the cure, to defend them from the painful irritation occasioned by exposure to vivid lights. A cure has sometimes been effected by the simple expedient of giving the eyes entire repose for two or three days, the patients remaining constantly, for that length of time, in a darkened room.[10]

6. The eyes ought to be bathed three or four times a-day with cold water.

7. If there is no suspicion of the disease being attended with any tendency to sanguineous congestion in the head, and other remedies have failed, cinchona may be tried as an anti-periodic. I have found bebeerine effectual in such cases.

8. Electricity, as a topical stimulus to the eye, has sometimes been employed with success. Also, exposing the eyes to the vapour of ammonia, every three or four hours.

9. In apoplectic cases, general and local depletion will of course take precedence of all other remedies.

10. Mr. Kidd strongly recommends[11] the internal use of turpentine, as given by Mr. Carmichael in iritis. (See p. 548.)

11. A residence on shore, and a return to Europe, are to be recommended in obstinate cases on board ship, or in the warm latitudes. These are also often the only means of preventing relapses in those who have already repeatedly suffered from night-blindness.

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[1] Medical Observations and Inquiries; Vol. i. p. 111; London, 1763.

[2] Quoted from the Medicinische Zeitung, in Dublin Journal of Medical and Chemical Science; Vol. viii. p. 123.

[3] Quoted from the Bulletin de Therapeutique, in Johnson's Medico-Chirurgical Review, July, 1842, p. 193.

[4] Medico-Chirurgical Transactions; Vol. v. p. 47; London, 1814.

[5] De Retina Observationes Anatomico-Pathologicæ, p. 158; Gottingæ, 1836.

[6] Darstellungen der Krankheiten des menschlichen Auges; Theil i. Taf. xix. Fig. 9, 10; Berlin, 1838.

[7] Rosier, Observations sur la Physique; Tome ix. p. 379; Paris, 1777.

[8] See case by Heberden, in his Commentarii de Morborum Historia, cap. 66.

[9] Dublin Journal of Medical Science, November, 1840, p. 169.

[10] See cases by Wharton, American Journal of the Medical Sciences, May, 1840, p. 93.

[11] Dublin Medical Press, May 10, 1843, p. 292.

SECTION XIII. — DAY-BLINDNESS.

Syn. — Diurnal amaurosis. See synonyms at beginning of last section.

Although day-blindness is enumerated by all systematic authors on the diseases of the eye, very little has been recorded on the subject from actual observation. Scrofulous intolerance of light, the photophobia of the albino, or the blindness of the captives of Dionysius, long shut up in the dark and suddenly brought out into the glare of day[1], must not be confounded with a periodical amaurosis, the counterpart of that which we have last considered. Day-blindness is mentioned as a symptom both of mydriasis and myosis. In the former disease, the pupil admits too much light to enable the patient to see till after sunset. In the latter, the contraction of the pupil is supposed to relax in the obscurity of the night, and the vision in this way to improve. On the same principle, the patient affected with incipient cataract sees little during the brightness of the day, but finds his sight in part restored by the dilatation of the pupil, which takes place in the evening.

Among the few original observations tending to establish the fact of there being such a disease as a periodic amaurosis, which makes its attack through the day, and departs at night, may be quoted the following from Ramazzini.

> "I have repeatedly observed," says he, "among our country people, and especially in boys, a thing sufficiently strange. In March, about the equinox, boys about ten years of age were affected with a great degree of weakness of sight, so that through the whole day they saw little or nothing, and wandered about the fields like blind people; but when night came they saw again distinctly. This affection ceased without any remedy, and by the middle of April the patients were completely restored to sight. I frequently observed the eyes of these boys, and found the pupils much enlarged."[2]

A gentleman related to Dr. Guthrie that he had witnessed the following example of day-blindness. Whilst in garrison in Landau, in Alsace, in the summer of 1772, two hundred men of the regiment of Picardie were seized with a species of blindness during the meridian splendour of the sun, and could not see their way when it was not overcast, insomuch that when they had strolled out into the fields during a cloudy day, if the sun suddenly shone out, they were absolutely obliged to be led by their companions till a cloud once more obscured the solar light, and enabled them to pursue their course.[3]

These instances look like an endemic or epidemic day-blindness; but are evidently too vague to furnish grounds for any general conclusions.

Larrey records a case of sporadic day-blindness, occurring in an old man, one of the galley-slaves at Brest, who had for thirty-three years been shut up in a subterraneous dungeon. His long residence in darkness had had such effect on the organs of vision, that he could see only under the shade of night, and was completely blind during the day.[4]

Another case, connected with a venereal taint, and cured by mercurial frictions, is related by Isbell.[5]

Case 870. In a hand-loom weaver, aged 58, residing at Auchtermuchty, Fifeshire, admitted at the Edinburgh Eye Infirmary under the care of Dr. Hamilton and Mr. Bell, and whose right eye had been destroyed by smallpox in childhood, the vision of the left eye had been invariably good, until the 21st of February, 1850, when, without pain or uneasiness of any kind, it suddenly left him. But, although totally blind during the day, he could see nearly as well as formerly by moon or star-light. He could not walk on the road by day without stumbling, and he therefore required a guide; at night, he could do so quite well. During the day, he could not see half the length of himself; by night he could see a house at about 200 yards' distance. At night, looking at the sky, he could quite well discern the stars and the moon, and the clouds passing over the moon; during the day, he could see nothing, a cloudy and clear sky being alike invisible.

He was recommended to keep a blister open behind his ear, to apply two leeches twice a-week to the under eyelid, and to take a blue pill, with rhubarb, every second night. In the course of eight or nine weeks, these prescriptions were followed by slow and steady improvement; his bodily health, however, appearing to give way, the remedies were discontinued, and a milk diet and bitter infusions substituted for them. Under this treatment, vision gradually improved; but he was much annoyed with the sensation of an object flitting before him, on every attempt to use the eye. At first it was of variegated colours, afterwards almost black. A sojourn of several weeks at the sea-side, where he had regular bathing, improved both his general health and his eyesight, and the ocular spectra or muscæ gradually disappeared during the summer and autumn. In October he was able to resume his occupation, continuing at the loom without interruption, his vision being as strong and perfect as ever. His power of vision by night, which had continued during all his illness, was not at all affected by the recovery of his sight by day.[6]

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[1] Galenus de Usu Partium; Lib. x. cap. 3.

[2] De Morbis Artificum, cap. xxxviii.; Opera, p. 363; Londini, 1718.

[3] Duncan's Medical Commentaries; Vol. xix. p. 290; Edinburgh, 1795.

[4] Mémoires de Chirurgie Militaire; Tome i. p. 6; Paris, 1812.

[5] Edinburgh Medical and Surgical Journal; Vol. ix. p. 269; Edinburgh, 1813.

[6] Monthly Journal of Medical Science; Vol. xii. p. 393; Edinburgh, 1851.

SECTION XIV.—HEMIOPIA.

Syn.—Hemiopia, from ἥμισυς, *half*, and ὄψις, *vision*. Visus dimidiatus.

Disposition of optic nerves.—It is generally admitted that there is a partial decussation of the primitive fibres of the two optic nerves in the chiasma; that this decussation affects principally their central and deep-seated fibres; and that the lateral and superficial do not cross. Consequently these last come, in each nerve, from the same side, while the former come from the opposite side of the brain. For the following hypothetical view of the subject we are indebted to Mr. Mayo.

Each tractus opticus is supposed to consist of three bands of fibres or nerve-tubes — an outer, a middle, and an inner. Each optic nerve consists, likewise, of an outer, a middle, and an inner series of nerve tubes. The inner series of each is commissural. The inner band of the one optic tract bends round into its fellow, forming the posterior border of the chiasma (*commissura arcuata posterior*, Hannover), and unites the origin of these two nerves. The inner band of the one optic nerve coalesces in like manner with its fellow, forming the anterior border of the chiasma (*commissura arcuata anterior*), and unites the two retinæ. Of the two bands which remain, the middle crosses its fellow (*commissura cruciata*), and forming the middle band of the opposite optic nerves, may be presumed to be distributed principally to that part of the inner half of the retina, about four-ninths of its whole extent, which springs from the nasal side of the optic nerve. The outer band of each optic tract (*fasciculus dexter et sinister*) becomes the outer band of the optic nerve of the same side, and is presumed to supply the temporal side of the retina, including the vertex or optic axis, and fully more than five-ninths of its whole extent.

The two eyes in man converge, in all positions, towards a common visual axis. Retinal surfaces are of two classes; those which can be turned towards a common visual axis, and those which cannot. To the former belongs that part of the human retina which is to the temporal side of the termination of the optic nerve in the eyeball. To the latter belongs the remaining part of the human retina, and the whole retina of those animals in which there is a complete decussation of the optic nerves, the whole of the right optic nerve going to the left eye, and *vice versâ*, as in the cod. The retinal surface which can be directed to a common visual axis is supplied by the optic nerve of the same side; the retinal surface which cannot be so directed is supplied by the nerve of the other side. The first is assumed to be the case with the outer five-ninths of the human retina; the second with the inner four-ninths, and with the entire retina of those animals in which the decussation is total, such as the cod.

In osseous fishes, each optic nerve is employed in looking to one side only; the right looks to the left, the left to the right. By analogy, in man, likewise, the right optic nerve should see to the left only. To determine whether this is the fact, it is necessary to consider which way the retinal surfaces in both eyes are directed. The fitting position of the eyes, for this examination, is that in which they are looking at a small object held immediately in front of the face, at the level of the eyes, and at the nearest point for distinct vision. In this position, almost the whole of that portion of the right retina which lies to the outside of the entrance of the optic nerve, is directed to the left; and the exactly different, complementary, or inner portion of the left retina, likewise, is directed to the left. Then, by analogy, the right optic tract should supply filaments to the portions, so specified, of the right and left retinæ; and that this may be the case, considering that the outside of the right optic nerve, and the inside of the left, consist of filaments from the right optic tract, seems anatomically probable. If the anatomical relation between the parts of the optic nerves and the retinal surfaces, so rendered probable, turn out to be correct, the simple expression of the facts will be — In vertebral animals the right nerve is employed in vision to the left, the left in vision to the right; or, in those which have single vision with two eyes, the right nerve is employed in vision to the left of the common visual axis, the left to the right of that axis.[1]

Hemiopia signifies a partial blindness obscuring about a half of the field of vision. Generally it is the right half or the left half of all objects which appears dark, and that whether they are regarded with one eye only, or with both. In other cases, only one eye is affected. It is necessary also to observe, that the upper or the lower half of the field of vision may appear dark; or that the patient, looking directly forwards, may see tolerably well within a certain angle, but nothing to either side. These varieties of hemiopia are less common than that in which the right or the left half of each retina appears to be insensible to light, but are not less worthy of attention.

It would appear, from the histories of hemiopia on record, that it is apt to be sudden in its attack, and to recur at considerable intervals of time.

Dr. Wollaston, a few years before his death, was the means of directing considerable attention to this disease, by his paper *On Semidecussation of the Optic Nerves*, published in the Philosophical Transactions. He had been twice attacked by hemiopia, and had occasionally met with it in others.

" It is now more than twenty years," says he, " since I was first attacked with the peculiar state of vision to which I allude, in consequence of violent exercise I had taken for two or three hours before. I suddenly found that I could see but half the face of a man whom I met; and it was the same with respect to every object I looked at. In attempting to read the name JOHNSON, over a door, I saw only SON, the commencement of the name being wholly obliterated to my view. In this instance the loss of sight was toward my left, and was the same whether I looked with the right eye or the left. This blindness was not so complete as to amount to absolute blackness, but was a shaded darkness without definite outline. The complaint was of short duration, and in about a quarter of an hour might be said to be wholly gone, having receded with a gradual motion from the centre of vision obliquely upwards towards the left.

" Since this defect arose from over-fatigue, a cause common to many other nervous affections, I saw no reason to apprehend any return of it, and it passed away without any need of remedy, without any farther explanation, and without my drawing any useful inference from it.

" It is now about fifteen months since a similar affection occurred again to myself, without my being able to assign any cause whatever, or to connect it with any previous or subsequent indisposition. The blindness was first observed, as before, in looking at the face of a person I met, whose *left* eye was to my sight obliterated. My blindness was in this instance the reverse of the former, being to *my right* (instead of the left) of the spot to which my eyes were directed; so that I have no reason to suppose it in any manner connected with the former affection.

" The new punctum cæcum was situated alike in both eyes, and at an angle of about three degrees from the centre; for when any object was viewed at the distance of about five yards, the point not seen was about ten inches distant from the point actually looked at.

" On this occasion the affection, after having lasted with little alteration for about twenty minutes, was removed suddenly and entirely by the excitement of agreeable news respecting the safe arrival of a friend from a very hazardous enterprise."[2]

In consequence of reflecting on these attacks of hemiopia, Dr. Wollaston was led to adopt the following hypothesis regarding the arrangement of the optic nerves, the hypothesis, in fact, of Sir Isaac Newton.[3]

" Since the corresponding points of the two eyes," says he, " sympathize in disease, their sympathy is evidently from structure, not from mere habit of feeling together, as might be inferred, if reference were had to the reception of ordinary impressions alone. Any two corresponding points must be supplied with a pair of filaments from the same nerve, and the seat of a disease in which similar parts of both eyes are affected, must be considered as situated at a distance from the eyes at some place in the course of the nerves where these filaments are still united, and probably in one or the other thalamus nervorum opticorum.

" It is plain that the cord, which comes finally to either eye under the name of optic nerve, must be regarded as consisting of two portions, one half from the right thalamus, and the other from the left thalamus nervorum opticorum.[4]

" According to this supposition, decussation will take place only between the adjacent halves of the two nerves. That portion of nerve which proceeds from the right thalamus to the right side of the right eye, passes to its destination without interference; and in a similar manner the left thalamus will supply the left side of the left eye with one part of its fibres, while the remaining halves of both nerves, in passing over to the eyes of the opposite side, must intersect each other, either with or without intermixture of their fibres.

" Now, if we consider rightly the facts discovered by comparative anatomy in fishes, we shall find that the crossing of the entire nerves in them to the opposite eyes, is in perfect conformity to this view of the arrangement of the human optic nerves. The relative position of the eyes to each other in the sturgeon, is so exactly back to back, on opposite sides of the head, that they can hardly see the same object, they can have no points which generally receive the same impressions as in us; there are no corresponding points of vision requiring to be supplied with fibres from the same nerve. The eye which sees to the left has its retina solely upon its right side; and this is supplied with an optic nerve arising wholly from the right thalamus; while the left thalamus sends its fibres entirely to the left side of the right eye for the perception of objects situated on the right. In this animal an injury to the left thalamus might be expected to occasion entire blindness of the right eye alone, and want of perception of objects placed on that side In ourselves, a similar injury to the left thalamus would occasion blindness (as before) to all objects situated to our right, owing to insensibility of the left half of the retina of both eyes."

Having thus explained his hypothesis, Dr. Wollaston goes on to relate the following additional instance of hemiopia.

"A disorder," says he, "that has occurred within my own knowledge in the case of a friend, seems fully to confirm this reasoning, as far as a single instance can be depended upon. After he had suffered severe pain in his head for some days, about the left temple, and toward the back of the left eye, his vision became considerably impaired, attended with other symptoms indicating a slight compression on the brain.

"It was not till after the lapse of three or four weeks that I saw him, and found that, in addition to other affections which need not here be enumerated, he laboured under a defect of sight similar to those which had happened to myself, but more extensive, and it has unfortunately been far more permanent. In this case the blindness was at that time and still is entire, with reference to all objects situated to the right of his centre of view. Fortunately, the field of his vision is sufficient for writing perfectly. He sees what he writes, and the pen with which he writes, but not the hand that moves the pen. This affection is, as far as can be observed, the same in both eyes, and consists in an insensibility of the retina on the left side of each eye. It seems most probable, that some effusion took place at the time of the original pain on that side of the head, and has left a permanent compression on the left thalamus. This partial blindness has now lasted so long without sensible amendment, as to make it very doubtful when my friend may recover the complete perception of objects on that side of him."

Towards the conclusion of his paper, Dr. Wollaston adds the following notice of another case of this disease.

"One of my friends," says he, "has been habitually subject to it for sixteen or seventeen years, whenever his stomach is in any considerable degree deranged. In him the blindness has been invariably to his right of the centre of vision, and, from want of due consideration, had been considered as temporary insensibility of the right eye; but he is now satisfied that this is not really the case, but that both eyes have been similarly affected with half-blindness. This symptom of his indigestion usually lasts about a quarter of an hour or twenty minutes, and then subsides, without leaving any permanent imperfection of sight."

Dr. Wollaston died about four years after the publication of the paper from which these extracts are taken. Whether he had any third attack of hemiopia, I know not; but in the account which has been published of the appearances observed on inspecting his body, we find it stated, that the optic thalamus of the right side was of an unusually large size, and that on making a section of it, little or no vestige of its natural substance was perceptible, with the exception of a layer of medullary substance on its upper part. It had been converted into a tumour, as large as a middle-sized hen's egg, towards the circumference of a greyish colour, and harder than the brain itself, somewhat of a caseous consistence, but in the centre of a brown colour, soft, and in a half-dissolved state. This diseased structure was not confined to the thalamus, but extended to the neighbouring portion of the corpus striatum. The right optic nerve, where it passes on the outside of the thalamus, was of a brown colour, more expanded, and softer than natural.[5]

The reader will readily perceive, that between this state of the brain, and the previous symptoms of hemiopia, there may or may not have been a connexion; for there were two distinct attacks of the disease, at the interval of twenty years, each attack subsiding entirely after fifteen or twenty minutes; in the first attack objects to the left appearing dark, and in the second, those to the right. We know that morbid alterations in the substance of the brain often produce periodic diseases, and that certain additional causes of excitement operating upon an unsound brain, one or other of the functions of that organ are for a time impeded, till the new cause ceases to operate, when the individual immediately returns to his former state of apparent health.

The following remarks have occurred to me, in reflecting on Dr. Wollaston's paper.

1. The notion of a semi-decussation of the optic nerves had not merely been entertained by several distinguished authors[6], before Dr. Wollaston, but had in some measure been demonstrated by dissection.[7] Even the idea that the two portions, of which each optic nerve may be regarded as consisting, remain distinct, after they form the retina, appears to belong to Sir Isaac Newton. It is supported, however, by Dr. Wollaston, by an argument which is new, and probably without foundation; namely, that any two corresponding points of the two retinæ must be supplied with filaments either from the right or from the left optic nerve, and that upon this depends their correspondence. Dr. Wollaston appears to have overlooked the fact, that as the optic nerves pass through the sclerotica and choroid considerably nearer the middle line of the body than the centre of the globe of each eye, the vertices of the two retinæ or the two optic axes, which, if any two points deserve to be considered as such, are surely corresponding points, will not be formed by filaments from the same nerve, but from opposite nerves. It has always occurred to me as more probable, that the several portions, of which each optic nerve consists, mingle their fibres, and then expand into the retina, so that this membrane in each eye should be regarded as a plexus, every point of which contains fibres derived from each side of the brain, while the fibres which are the most essential for vision are derived, for the right side of the two retinæ, from the right side of the brain, and *vice versâ*, the remaining fibres fulfilling a commissural or consensual office.

2. It is not, however, by mere reasoning upon a subject like this, that we can arrive at any sound conclusion. By far the greater part of the mass of facts, in pathological and in what may be called experimental anatomy, touching this question, go to prove, that injuries and diseases affecting one side of the brain, instead of hemiopia in both eyes, produce amaurosis only in the opposite eye.[8] The fact, also, which has been already mentioned in the beginning of this section, that we meet with a horizontal as well as a perpendicular hemiopia, appears scarcely reconcileable to the hypothesis of Dr. Wollaston. Not so, however, that other variety of the disease, in which objects to each hand appear dark, and those only which are placed within a certain angle in front are seen distinctly; for were any tumour to press on the anterior edge of the chiasma of the optic nerves, the effect would be, according to the hypothesis of semi-decussation, to paralyse the inner half only of each retina. I had under my care a patient with amaurosis of the inner half of each retina, attended with total loss of the sense of smell, and an imperfect

sense of taste. He presented no other signs of cerebral disease, and I thought it probable that the imperfection in taste was owing to the loss of the power of smell, and this, along with the hemiopia, to some pressure on the optic nerves, immediately in front of the chiasma, and on the olfactory nerves.

Treatment.—Hemiopia, being merely a peculiar variety of amaurosis, must be treated on similar principles. The patient's constitution, whether plethoric or debilitated, the state of his digestive organs, the presence or absence of cerebral symptoms, as headache, vertigo, &c., must be taken into account, and guide us in the choice of remedies.[9]

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[1] Medical Gazette; Vol. xxix. pp. 229, 277; London, 1841.

[2] Philosophical Transactions, for 1824; Part i. p. 224.

[3] Query 15th, at the end of the Opticks.

[4] Although the tractus opticus first becomes apparent at the under surface of the corresponding optic thalamus, the origin of the optic nerves is now acknowledged to be, not in the parts called thalami nervorum opticorum, as Dr. Wollaston believed, but in the corpora quadrigemina, parts analogous to the optic lobes of birds, reptiles, and fishes.

[5] Medical Gazette; Vol. iii. p. 293; London, 1829.

[6] Newton, Vater, Ackermann, Vicq-d'Azyr, Caldani, Cuvier, &c.

[7] Josephus et Carolus Wenzel de Penitiori Structura Cerebri, pp. 109, 333; Tab. vi. fig. 1; Tubingæ, 1812.

[8] Serres, Anatomie Comparée du Cerveau; Tome i. p. 331; Paris, 1827.

[9] On hemiopia, consult Arago, Annales de Chimie; Tome xxvii. p. 109: Crawford, London Medical and Physical Journal; Vol. liii. p. 48: Pravaz, Archives Générales de Médecine; Tome viii. p. 59; ix. p. 485.

CHAPTER XXV.

DISEASES OF THE FIFTH NERVE, AFFECTING THE ORGAN OF VISION.

SECTION I.—PAINFUL AFFECTIONS OF THE FIFTH NERVE.

§ 1. *Neuralgia of the ocular and orbital branches of the fifth nerve.*

Syn.—Neuralgia, from νεῦρόν, *nerve*, and ἄλγος, *pain.* Prosopalgia, from πρόσωπον, *face*, and ἄλγος, pain. Tic douloureux, *Fr.*

The branches of the first and second divisions of the fifth nerve, distributed to the eye, eyelids, and circumorbital region, are more frequently the seat of severe pain than any other nerves of the body.

Distribution of the fifth nerve.—It may not be improper to recall to mind, that the superficial situation of these nerves exposes them more than most others to mechanical injuries, and to the impression of cold: their being transmitted through narrow fibrous or osseous passages may also contribute to the frequency of their painful affections. The fifth nerve, by means of its motive root, stimulates the muscles of mastication, and by means of its sensitive root gives sensibility to the teeth, and to the whole surfaces of the face, internal and external. Whatever sensibility the facial and other motor nerves of the face possess, they derive from the fifth. This nerve passes through every muscle of the face, to gain the skin, to which it is ultimately destined. It penetrates into the organs of smell, vision, hearing, and taste, communicating common sensibility to the varied textures of these, the organs of special sensibility. By means of fibres from the great sympathetic, which join the fifth nerve anteriorly to the Gasserian ganglion, this nerve is regarded as presiding over the nutrition of the parts to which it is distributed.

Besides the ciliary nerve, a branch of the nasal, which (joining a branch from the motor oculi to form the lenticular ganglion) gives sensibility to the interior of the eyeball, we have six branches of the fifth radiating from the orbit to the surrounding parts; *viz.* the infratrochlear, the supratrochlear, the supra-orbitary, the lacrymal, the malar, and the infra-orbitary.

In the consideration of neuralgia of the fifth nerve, we set aside those instances in which pain is communicated through its medium, in consequence of inflammation or of disorganizing diseases of the eye and its appendages.

Varieties.—It is of importance, in a practical point of view, to distinguish the following varieties of neuralgia of the branches of the fifth nerve, passing through the orbit, and distributed to the eyeball, eyelids, and neighbouring parts.

1. The simplest and most frequent variety is an acute affection of the ultimate ramifications of the nerve, and chiefly of those distributed above the orbit, attacking individuals in every respect healthy and robust, and arising distinctly from the influence of cold. The paroxysms in this variety observe a quotidian type, the general period of the pain being from eight or nine a. m. till five or six p. m.

The branches of the frontal and lacrymal nerves are those chiefly affected in this variety of neuralgia. During the paroxysm the eye reddens and discharges tears. The pain reaches its point of greatest severity about noon, after which it gradually relaxes, and generally abates so much as not to prevent sleep during the night.

The average duration of this acute peripheral neuralgia is eight or ten days. It yields readily to proper external and internal remedies, and is liable to recur only after renewed exposure to the original exciting cause. It prevails most during the east winds of spring. I have never seen any reason to suppose it to be in any way connected with ague or its causes.

2. In the next variety a cicatrice of the eyebrow, or other neighbouring part, marks the seat of some previous injury, which had implicated one or other of the branches of the fifth nerve. In cases of this kind the cicatrice is more or less indurated, and painful to the touch; the pain radiates along the nerve, when the cicatrice is pressed, and a firm cord may sometimes be traced from the cicatrice, both along the forehead, in the course of the distribution of the nerve, and also backwards into the orbit.

The pain in such traumatic cases is not confined to the nervous branches which had been injured, but affects other branches of the fifth nerve. Even distant nerves sometimes become the seat of neuralgia from such a cause.

3. Tubercular and calcareous depositions in contact with branches of the nerve, or contained within their neurilemma, have proven the causes of neuralgia.[1]

4. It seems to be generally admitted that there is a variety of neuralgia of the face, either depending on ague or originating in the same causes, and especially in malarious influence.

This febricose neuralgia will be met with chiefly in fenny districts, and be characterised by the symptoms of pyrexia by which it will be attended, or with which it will sometimes alternate, and by the periodicity of its attacks. It may be expected in some cases to follow a regular quotidian, tertian, or quartan type, while, in other instances, it may be irregular in its paroxysms, occurring perhaps once in eight days, or even at longer intervals, and varying much in the severity and duration of its attacks.

5. What has been called rheumatic or arthritic neuralgia generally affects the branches of the fifth pair going to the teeth long before it attacks the orbital branches of the same nerve; the teeth have decayed, and many of them have dropped out; the patients are in general old and feeble, and have long suffered from dyspepsia, their eyes are covered with varicose vessels, their crystalline lenses have become glaucomatous, and their retinæ are unsound.

The theory of the febricose, as well as of the rheumatic or arthritic variety, supposes the affected branches of the nerve to form a focus of attraction for a morbific matter generated in the blood, each paroxysm being followed by a period of convalescence, which lasts until the morbid matter has been again sufficiently accumulated to induce the same degree of irritation of the nerves.[2]

6. Some neuralgiæ own a central origin, the painful paroxysms being associated with a variety of symptoms indicative of serious organic changes within the head. The causes of this variety of neuralgia are often productive of pressure on other nerves, as well as irritation of the fifth; they terminate in such alterations of tissue as leave the parts formerly the seat of pain in a state of anæsthesia, and in some rare cases are attended with exophthalmos[3], or even with visible deformation of the cranium. It is remarkable that in cases of this kind, although the efficient cause is central, there may be no pain within the head, but only at the periphery of the nerve, namely, in the face.

The last five varieties of neuralgia follow a chronic course.

Symptoms.—In the commencement of neuralgia, the pain occurs only momentarily, and perhaps not oftener than once or twice in the 24 hours. The upper eyelid, the middle of the eyebrow, the nasal extremity of the superciliary arch, the inner canthus, or the temple, is its most frequent seat. The side of the nose, the lower lid, the cheek, the ball of the eye, and the parts behind the eye, are less commonly affected in incipient cases. As the disease proceeds, the pain becomes more violent, but still continues only for an instant, and is often compared by the patient to an electric shock. Gradually its attacks are more frequently repeated, last longer, although rarely above half a minute, and attain a degree of overpowering severity. The pain is often referred to a single spot.

In chronic cases, we observe that during a paroxysm, the eyebrows are knit, the lids firmly closed, the angle of the mouth drawn towards the ear, the jaws pressed together, and respiration as much as possible suppressed. The muscles in the immediate vicinity of the pain are sometimes affected with a degree of quivering, tremor, or slight convulsion; but this is not an invariable symptom, and when it does occur seems to be merely an effect of the violence of the pain. The pain is not equally violent during the whole time of an attack. In general, it increases by degrees, and is most severe a short time before it ceases. The disease may, in some cases, be said to be continued;

but in general it is remittent, and, in many instances, completely intermittent, so that, whenever the fit is over, the patient feels perfectly free from uneasiness in the part, which but an instant before was the seat of excruciating pain. We meet with cases, however, in which a degree of uneasiness still continues, although the agonizing pain is gone. In long continued cases, the parts to which the pain is referred become swollen from serous effusion into the cellular tissue, and so exquisitely tender in general that they cannot bear the slightest touch. Firm pressure can sometimes be borne, and even gives relief, while a gentle touch will excite a fit of pain. Sir Charles Bell mentions a case in which the patient, on the recurrence of the pain, pressed one finger firmly on the infra-orbitary hole, another upon the inner canthus, a third upon the frontal nerve, and a fourth before the ear; and thus he stood, fixed in posture, though trembling with exertion.[4] Facial neuralgia sometimes alternates with severe nervous pain in other parts of the body.

The symptoms occasionally attendant on neuralgia of the fifth nerve, and indicative of serious organic changes within the cranium, are amaurosis, inflammation of the conjunctiva and sclerotica, inflammation of the iris, or, at least, discolouration of the iris with contracted pupil, easily distinguishable from any of the ophthalmiæ, inflammation of the cornea with onyx ending in ulceration, palsy of the muscles of the eyeball, and of the levator palpebræ superioris, and deformity of the bones forming the back and roof of the throat. The inflammation and other changes of the eye in such cases resemble very much the effects produced in Magendie's experiment of dividing the trunk of the fifth nerve; and after a time the pained parts become insensible to external impressions. In one case of this sort, which came under my care, the uvula was drawn entirely to one side, and a tumour was felt behind the veil of the palate, which I regarded as perhaps owing to a dilated state of one of the sphenoid sinuses. In such cases, the patient by and bye manifests a stumbling walk, and a drawling speech, he has epileptic fits, his intellect becomes deranged, and at last a stroke of apoplexy is the immediate precursor of death.

Constitutional symptoms.—It is chiefly in confirmed cases that symptoms of this kind are present. When the disease has continued for a length of time without amelioration, and the attacks are frequent, the patient becomes restless and melancholy, insensible to the pleasures of society, and incapable of occupation. The appetite for food fails, digestion is impaired, the bowels are constipated, the body becomes emaciated, the sexual passion is extinguished, and the patient is almost totally deprived of sleep. In some instances, facial neuralgia is accompanied with febrile symptoms; in others, with nervous debility, great coldness of the body, especially of the extremities, and sluggish pulse.

Subjects.—No age is exempt from circumocular neuralgia. Men are more frequently affected with it than women. It is by no means the nervous or hypochondriac that are most exposed to it.

Causes.—In the acute variety, the disease arises from causes similar to those which produce rheumatic ophthalmia, and especially continued exposure to draughts of cold air. In chronic cases, we observe a variety of occasional circumstances which operate in reproducing the paroxysms; as, the motions of the face in speaking, chewing, or swallowing, simple touching of the part, the shocks which the body is apt to undergo in walking or riding, the blowing of the wind over the face, the sudden opening or shutting of a door, and many others. The paroxysms are much more frequent during the day, on account of the presence of many more exciting causes, than during the night. The complaint is much aggravated during the prevalence of easterly or north-easterly winds.

When neuralgia is the result of a wound, there is reason to think that inflammation of the nerve, with hypertrophy and induration of its neurilemma, has been produced.

In rheumatic or athritic cases, the symptoms are often relieved after the removal of carious teeth[5], or the fangs of decayed teeth, or the exfoliation of portions of the alveoli, showing, as happens also in traumatic cases, how the effects of disease in one portion of the trigeminus may be reflected to another.

When along with neuralgia there are paralytic symptoms, affecting the muscles of the eyeball, the eyelids, or the face, it is probable that there is pressure on certain of the motor nerves, as well as on the fifth, from thickening of the dura mater or of the cranium, spiculæ of bone projecting from the inner table, or the like.[6] As examples of the anatomical changes found on dissection in chronic cases, may be mentioned, aneurisms of the cerebral vessels, an aneurism of the carotid artery by the side of the sella turcica, pressing on the Gasserian ganglion, scirrhous and other tumours in the pons Varolii, and atrophy of the trunk of the fifth nerve.[7] In such cases it is generally plain during life that neuralgia does not constitute the original disease, and that the evil does not reside in the branches of the nerves to which the pain is referred, but at its origin in the brain, or at any rate within the cavity of the cranium. In most of these cases dissection has shown the disease to be seated, not in the nerve-tubes, but amid the grey substance of some of the nervous centres. By investigating the history of the patient's previous health, we shall find reason, in some cases, to suspect syphilitic nodes, or exostoses, within the skull; and in every case, we must direct our attention not merely to the particular symptoms for which the patient seeks relief, but to the state of the functions generally. If the explanation of the symptoms be obscure, we must watch, with more than ordinary attention, their progress, or their retrocession, under the influence of the remedies we prescribe.

Treatment.—The means which are found most successful appear to have been discovered solely by experience. Although some of them are empirically specific also in intermittent fever, practitioners appear to have had recourse to them in neuralgia, without any reference to their power over ague.

1. Great relief is obtained, especially in acute cases, from warm fomentations. A pretty large basin of boiling water being placed on a table before the patient, he is directed to throw a shawl over his head and over the basin; he is then to hold the head so that the

pained part shall receive the steam of the boiling water, as long as any steam rises; and after that, to dip a sponge into the water, wring it, and hold it to the seat of pain. This is to be continued as long as it affords relief, and repeated when the paroxysms threaten to recur.

Poppy decoction, laudanum and water, camomile decoction, and the like, may be used in fomentation.

2. It is proper to attend to the state of the patient's stomach and bowels, before having recourse to tonics, or any other class of remedies. Dr. Vaidy has recorded a case, cured by the emetic and purgative effect of three grains of tartrate of antimony. On purging with calomel at bed-time, followed next morning by salts and senna, or compound powder of jalap, copious dark stools are often evacuated, and followed by much relief.

3. We are highly indebted to Mr. Hutchinson, of Southwell, for the introduction of the precipitated carbonate of iron, as a remedy in neuralgia. I have used it in a variety of cases, both acute and chronic. In the former it has scarcely ever failed to prove successful. In painful affections of the circumorbital region, accompanying glaucoma and amaurosis, I have also found it serviceable. In cases apparently connected with serious organic changes within the cranium, it has not appeared to be productive of any effect.

As the precipitated carbonate of iron is innocuous, we may commence with a large dose. I generally order from half a drachm to a drachm every hour, in a wine-glassful of water. Treacle is a good vehicle, as it tends to counteract the constipating effect of the iron. Mr. Hutchinson mentions a case in which half a drachm three times a-day produced little perceptible benefit; he increased the dose to a drachm twice a-day, when, after three days, a very sensible abatement of the number and violence of the paroxysms was observed; he again increased the dose to four scruples twice a-day, in which the patient persevered regularly for ten weeks, at the expiration of which time, not the slightest vestige of the disease remained. He gives several other cases, in which little or no effect was produced by smaller doses than four scruples twice a-day. Mr. Hutchinson's pamphlet is well worthy of perusal.[8]

4. When carbonate of iron fails, I am in the habit of exhibiting pretty large doses of sulphate of quina. Two or three, and sometimes even five or six grains require to be given thrice a-day, or oftener. This medicine proves most efficacious in intermittent cases.[9] I have known the daily dose of 24 grains, repeated for a few days, cure the disease, where iron first and then belladonna had failed.

5. Another remedy of great utility in the treatment of this disease is belladonna, the suggestion of which we owe to Mr. Bailey, of Harwich. It is a medicine of so much activity, that it must be given with a cautious hand. The form which I have occasionally adopted for internal, as well as frequently for external use, is a vinous tincture, prepared by macerating, for four days, one ounce of the extract in one pint of white wine. Of this, as a dose, I begin with five drops thrice a-day, increasing gradually to 15 drops. Employed in this manner, the wine of belladonna is found to soothe, and often entirely

to remove neuralgia of the fifth nerve, especially in cases deemed rheumatic or arthritic. The use of this medicine, however, induces a very peculiar sense of thirst and constriction in the throat; and in larger doses than those above mentioned, it brings on cramp of the stomach, dilatation of the pupils, temporary blindness, vertigo, and a highly distressing feeling of weakness and sinking.

The cases related by Mr. Bailey[10] are extremely interesting. He ventures on two or even three grains of the extract at once, and appears to have been led to this mode of exhibiting the medicine from the difficulty of getting the patients to continue smaller doses for any length of time, in consequence of its unpleasant effects, while many were completely and permanently relieved by a single large dose. I have found belladonna useful in almost every variety of neuralgia; but of late I have prescribed it less frequently than I once did, in consequence of finding so much good produced by the precipitated carbonate of iron.

6. Although in many instances, any degree of affection of the mouth, from mercury, is found to aggravate the symptoms of neuralgia, yet calomel and opium have been recommended, and have occasionally proved useful. When the disease depends on thickening of the bones or membranes of the cranium, calomel and opium are more likely to do good than any other remedy. In a case, attended with ulceration of the cornea, which arose without any active inflammation, and apparently merely as a consequence of the diseased state of the fifth nerve, I found calomel and opium internally, and the lunar caustic solution externally, successful in procuring the cicatrization of the ulcer. I have also known the pain subdued by salivation. Having occasion to administer calomel with opium, for rheumatic ophthalmia, to a nobleman, long troubled with severe neuralgia of the occipital nerve, which had resisted all sorts of treatment, so long as the mercurial influence continued, the neuralgia was completely relieved.

7. Arsenic, combined generally with opium, has often been tried in this disease; and numerous instances of its efficacy have been recorded.[11] Fowler's solution and water are mixed in the proportion of half an ounce of each, of which mixture 16 drops are to be given thrice a-day, immediately after food, and continued till the specific effects of the mineral show themselves.

8. Narcotics of every sort have been used in neuralgia, both internally and externally. It is often necessary to combine them with the other classes of remedies, especially with tonics.

Temporary relief is generally obtained from preparations of opium. Sir Henry Halford notices a case, however, in which opiates gave relief only at night, but failed in the largest doses in the day-time.

It has been proposed to keep the patient continually narcotised for some days. By administering half a grain of acetate of morphia, with three grains of camphor, every four hours for three or four days, the paroxysms, by the end of that period, have been more endurable, and have been known to continue so.[12]

Mr. Lawrence states[13], that of all the narcotics, the only one on which he has any reliance is conium. Given largely, and at short intervals, so as to produce some of its peculiar effects on the nervous system, he has known it put a stop to the paroxysms, and for such a length of time that he had come to the conclusion that it had cured the disease. In some instances, he states, where persons remained well for several months, and even, in one case, for more than a year after the use of the conium, although the pains again returned, yet the agony was considerably controlled by this medicine.

Fleming's tincture of aconite possesses very considerable anti-neuralgic properties, whether given internally or applied in friction to the skin. One drachm of the tincture being mixed with seven drachms of water, the incipient dose may be ten minims thrice a-day, increasing daily to the extent of one minim each dose, until the physiological effects of the aconite appear.[14]

An extract of the seeds of stramonium in doses of half a grain, two hours before the paroxysm, appears to have succeeded, even in cases where sulphate of quina, and other remedies had failed.[15]

Narcotic plaisters sometimes serve to moderate the pain. They are made with opium, conium, belladonna, and the like. One composed of soap cerate, extract of belladonna, and acetate of lead, has been recommended.[16]

Ansiaux relates[17] two cases, in which a cure was effected by the daily application of acetate of morphia to a small blistered surface, near the seat of the pain.

9. Detraction of blood, such as by leeches over or near the spot, has sometimes proved useful.[18]

10. Counter-irritation sometimes does good. A blister may be raised by placing over the part the lid of a pill-box, containing a bit of lint, moistened with concentrated aqua ammoniæ. A tartar emetic plaister has been known to prove efficacious, by causing pustules and ulcers over the pained part.

11. In the incurable cases, depending on organic changes within the cranium, palliatives must be employed. A local vapour bath, the vapour of chloroform by way of douche[19], the inhalation of the vapour of sulphuric ether or of chloroform[20], external applications of conium, or belladonna, and stimulating liniments combined with laudanum, afford temporary relief; but are not all equally safe. The inhalation of chloroform, for example, in cases of cerebral disease, would be attended with danger. Sometimes such remedies remove the pain permanently, although the organic change on which the pain depended is slowly advancing. Friction with tar on the pained part, and in the neighbourhood, has been found useful.[21]

12. The division of the affected nerves, as they make their exit from the orbit, a remedy which, at one time, was generally had recourse to, now seems to be abandoned; the benefit derived from the operation proving only temporary. As a cessation for months from severe suffering, however, has sometimes been obtained from this means, it may in certain cases be justifiable to have recourse to it.

13. In cases of tubercular or calcareous depositions in the nerves of the face, the extirpation of the growth is evidently indicated.[22]

§ 2. *Hemicrania.*

Syn.—Hemicrania, from *ἥμισυς*, half, and *κράνον*, the head. La Migraine, *Fr.*
Neuralgia cerebralis, *Romberg.*

Nearly allied to neuralgia, is a painful affection which sometimes extends to the forehead and face, and especially to the orbit and eyeball, assumes more or less of an intermittent form, and receives, from the circumstance of its being generally confined to one side of the head, the name of *hemicrania.* An inflammation of the eye, chiefly sclerotic, easily distinguished from any of the ordinary forms of the ophthalmiæ, sometimes attends this disease. The iris is occasionally discoloured, and the pupil irregularly expanded or contracted; but there is no effusion of lymph. Vision is somewhat dim.

The paroxysms vary in duration from a few hours to a day or longer. They occur at irregular intervals of about three or four weeks, being preceded by chilliness, yawning, and irritation of temper, and terminate generally by vomiting and sleep. Prolonged during many years, hemicrania diminishes greatly, or disappears entirely, in advanced age.

The disease is often connected with a hysteric diathesis. It is frequently an attendant on pregnancy, or occurs during the debility brought on by suckling. Its intermittent character is sometimes to be traced to a connexion with the causes of ague.

Dr. Turenne supposes hemicrania to depend on congestion of the cavernous sinus, causing pressure on the ophthalmic division of the fifth nerve.[23] He considers the relief obtained from bending the head backwards, to arise from the emptying of the cavernous sinus. A protrusion of what are called the Pacchionian glands into the interior of the sinuses of the brain, has also been supposed to be a cause of hemicrania, by the impediment they offer to the return of the blood.[24]

The remedies most efficacious are such as afford relief in genuine intermittents. Frequently, when bark fails, the arsenical solution is found to act most favourably. I have known several cases completely cured by the use of sarsaparilla.

"In the treatment of cases of this kind," observes Dr. Bright,[25] "it is occasionally impossible not to feel anxious, lest some more fixed disease should be giving rise to the symptoms, more particularly if other circumstances, as sickness, giddiness, or loss of power or sensation, should casually occur. But while we carefully watch every new symptom, we must not be induced too easily to relinquish our remedy, as it frequently happens that several days elapse before any improvement is manifest."

This last remark applies, whatever be the remedy we have selected.

Debilitating remedies, such as abstraction of blood by leeches, and counter-irritation, are to be avoided.

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[1] Hamilton, Dublin Journal of Medical Science, May 1843, p. 217; Allan, Monthly Journal of Medical Science, January 1852, p. 46.

[2] Todd and Bowman's Physiological Anatomy, Vol. ii. p. 115, London, 1847.

[3] Carline, Dublin Quarterly Journal of Medical Science, August 1849, p. 247.

[4] Nervous System of the Human Body, p. cxi.; London, 1830.

[5] Emmerich, Medical Gazette, April 7, 1848, p. 613.

[6] Halford's Essays and Orations, p. 39; London, 1831: Travers' Further Inquiry concerning Constitutional Irritation, p. 351; London, 1835.

[7] Romberg's Manual of the Nervous Diseases of Man; Vol. i. p. 41; London, 1853.

[8] Cases of Neuralgia Spasmodica, commonly called Tic Douloureux, successfully treated; London, 1822.

[9] Van Swieten, Commentaria in Boerhaavii Aphorismos; Tom. ii. § 757.

[10] Observations relative to the Use of Belladonna in Painful Disorders of the Head and Face; London, 1818.

[11] Gräfe und Walther's Journal der Chirurgie und Augenheilkunde; Vol. iv. p. 676; Berlin, 1822: Collections from the unpublished Medical Writings of C. H. Parry, M.D.; Vol. i. p. 560; London, 1825.

[12] British and Foreign Medical Review for 1844, p. 411.

[13] Lectures on Surgery, Medical Gazette; Vol. vi. p. 647; London, 1830.

[14] Fleming's Inquiry into the Properties of the Aconitum Napellus, p. 23; London, 1845.

[15] Journal Complémentaire du Dictionnaire des Sciences Médicales; Tome viii. p. 182; Paris, 1820.

[16] Medico-Chirurgical Review, January 1837, p. 235.

[17] Clinique Chirurgicale, p. 306; Liège, 1829.

[18] Vaidy, Journal Complémentaire du Dictionnaire des Sciences Médicales; Tome viii. p. 180; Paris, 1820.

[19] Hardy, Dublin Medical Press, April 19, 1854.

[20] Sibson, Medical Gazette, March 31, 1848, p. 535.

[21] Colville, Edinburgh Medical and Surgical Journal; Vol. x. p. 288; Edinburgh, 1814.

[22] On Neuralgia, consult Essay on the Remittent and Intermittent Diseases, by John Macculloch, M.D.; Vol. ii. p. 1; London, 1828: Anatomy, Physiology, and Diseases of the Teeth, by Thomas Bell, p. 309; London, 1829: Sir Charles Bell's Practical Essays, Part i. p. 83; Edinburgh, 1841.

[23] Lancet, August 18, 1849, p. 177.

[24] Blandin, Ibid., p. 178.

[25] Reports of Medical Cases; Vol. ii. p. 508; London, 1831.

SECTION II.—ANÆSTHESIA AND IMPEDED NUTRITION OF THE OPTIC APPARATUS FROM DISEASE OF THE FIFTH NERVE.

From *α privative*, and *ἀισθησις, sense.*

Varieties. Anæsthesia of parts supplied by the fifth nerve may be external or internal in its origin. A wound of the supra-orbitary or infra-orbitary branch, for example, is an external cause; a tumour in the pons Varolii is an internal one.

A branch or two only of the nerve may be in such a state, as shall cause anæsthesia of the parts to which they are distributed; or the whole nerve may be affected, the motor root as well as the sensitive, and then, in addition to anæsthesia, the muscles of mastication will be paralysed. Other nerves besides the fifth may be implicated, especially the facial, the sixth, and the third; and then palsy of the face, or of the muscles of the eye, will be present. Smell, vision, and hearing may be destroyed by the cause extending to the olfactory, optic, and auditory nerves.

When disease within the cranium, such as a tumour in the pons Varolii, affects the fifth nerve, a train of symptoms is produced, similar to the changes which have been observed to follow the division of its trunk in experiments on the lower animals.[1] Besides anæsthesia of the skin of the eyelids, the conjunctiva, the Schneiderian membrane, and other parts supplied with common sensibility by the fifth nerve, and loss of taste in the corresponding side of the tongue, vision becomes impaired or lost, the lachrymal secretion ceases, and inflammation of the eye takes place, ending in opacity, ulceration, and bursting of the cornea. Severe neuralgia sometimes precedes anæsthesia, alternates with it, or even accompanies it; so that though the parts affected are insensible to external impressions, such as touching or scratching them, they communicate to the sensorium acute feelings of pain, arising from internal morbid changes affecting the trunk of the nerve. In a case of anæsthesia shown by M. Montault[2] at Magendie's lectures, the eye was turned inwards in consequence of palsy of the abductor. So complete was the loss of sensation in the conjunctiva, in this instance, that the patient could seize his eye with his fingers, and turn it outwards, without winking, without suffering any pain, and even without feeling that the eye was touched. In such a case, the reflex act of nictitation is not performed, even although the facial nerve is sound, as the feeling which leads to that act in the normal state is lost. Even pricking of the bulb of the eye, or roughly touching it, does not cause winking, although the voluntary power over the lids remains, and the patient closes the eye firmly when told to do so.[3] In such a state, foreign bodies lighting on the conjunctiva not being removed, excite inflammation; but it is generally thought that the opacity and sloughing of the cornea are owing, not so much to this cause as to the disturbed nutrition of the whole organ, from want of the nervous energy naturally communicated through the fifth nerve. External stimulants applied to the eye in such a state cause redness of the conjunctiva, but no pain.

The various symptoms follow each other, sometimes in one order, sometimes in another. In some cases the amaurosis, in others the neuralgia, and in others the anæsthesia, is the complaint which attracts most attention; sometimes the disease is looked upon merely as an obstinate ophthalmia, and in other instances it is considered as a paralysis. In some instances, the destruction of the eye is prompt; in others, although sensibility to light is lost, and the surface of the eyeball and eyelids insensible to common stimuli, the coats and humours continue sound.

Pathological Anatomy. — Scrofulous and other tumours pressing on the root or on the course of the fifth nerve, an apoplectic clot, ramollissement of part of the brain, induration, ramollissement and atrophy of the Gasserian ganglion, or of some of the branches of the nerve, are the changes which have been detected on dissection, in cases of anæsthesia.

Cases. — Numerous cases of anæsthesia of the parts supplied by the fifth nerve are recorded.[4]

Case 871. — While the British troops were quartered in Portugal in March, 1828, Lieutenant —— fell with considerable force from the top to the bottom of a flight of stairs, having missed his step in the dark, when the left side of his face struck with violence against a flag. On seeing him some hours after this accident, Mr. Russell found that all that side of his head and face was much swollen and bruised. He complained of headache and a numbness of the face. He was bled, aperients were ordered, and fomentations to the injured part. When the symptoms of injury of the head had disappeared, and the swelling abated, he continued to complain of numbness of the left side of the face, extending from just below the orbit along the ala nasi to the tip of the nose, and to the upper lip, exactly as far as the centre of its depression, corresponding precisely with the distribution of the facial division of the second branch of the fifth nerve.

On searching for the cause, Mr. Russell readily found that the margin of the infra-orbitary foramen was broken off, causing a sharp spicula, which either pressed on the nerve, or had divided it at the very point of its exit upon the face.

Six months after the accident, the side of the face was still quite insensible to the touch, or even when gently pricked with a sharp point; the razor skimmed over the left side of the upper lip unfelt; and when he applied a vessel to his mouth, a sensation was imparted as if its edge were broken off at the part touching the affected lip.

The expression of the countenance was not at all affected, for when he spoke, laughed, or sneezed, the muscles of both sides acted in perfect unison.[5]

Case 872.—L. A., a healthy girl about 20, came under the care of Sir Charles Bell, in October 1822. Seven years before that period, she had received a blow with a stick on the right eye, after which she thought that the sight was never so good. The dimness had increased, but she could still distinguish small objects till June 1822. At that time, she became affected with pain in the right ear, deafness, and a discharge from the ear; she also suffered from severe headaches, affecting only the right side of the head, and soon after, lost the sight of the right eye altogether. She felt a dull pain at the internal canthus, which seldom abated, and at times there was a copious flow of tears. The motion of the iris remained perfect. Things continued in this state for about two months, when the pain and discharge from the ear ceased, and in a few days more the surface of the eye became perfectly insensible to the touch. This loss of feeling extended to the lining of the eyelids, to the skin covering them, and to the skin of the cheek and forehead for about an inch round the eye; it did not go beyond the middle line of the face. When she told Sir Charles that her eye was *dead*, as she expressed it, he drew his finger over its surface, and so far was this from giving her pain, that she assured him she could not feel that he was touching it at all. The eyelids made no effort to close while he was doing this, but the conjunctiva appeared sensible to the stimulus, as a number of vessels on the surface of the eye became immediately injected.

At this time, a perpetual blister was applied behind the ear, and two grains of calomel given night and morning, with a view of affecting her mouth. After a few days, however, the pain in the ear and deafness increased, but with scarcely any discharge; and, at the same time, the sensibility of the eye and surrounding skin returned. The sight appeared totally gone. Partial headaches continued, and at times the patient felt pain at the inner corner of the eye. She had always a perfect command over the muscles of the face and eyelids, and there was no affection whatever of the muscles of the face.

On the 25th October, she had a violent hysteric fit, followed by general headache. The latter subsided after venesection, a cold embrocation to the vertex, a blister to the nape of the neck, and free purging. Apprehensive lest organic disease might be extending itself in the head, Sir Charles kept her confined to bed and on the lowest regimen, and purged her daily.

On the 2d November, she said she had felt all night as if there was sand in the blind eye, and that sometimes sparks of fire seemed to pass through it. There was no change in the appearance of the eye. On the 3d, when she awoke these sensations were gone, but she was agreeably surprised to find that her sight was restored. When the left eye was closed, she could see large objects very distinctly with the right, but could not read or discern anything very small.

On the 4th, she could read small print, and the sight, although not quite so good as in the left eye, soon became pretty much as it had been immediately after the injury.

The blow on the eye had probably produced only a predisposition to disease. The gradual manner in which sight was lost, and its sudden recovery when the system was reduced by severe evacuation, point out the connexion of the complaint with an increasing fulness of habit. The only nerves affected appeared to have been the optic, and at one time the first division of the fifth.[6]

Case 873.—A patient, under the care of Dr. Alison, was affected with loss of common sensation in the left side of the face, the left nostril, and left side of the tongue, with insensibility of the ball of the eye, and occasional bloody discharge from the left nostril; and was liable to attacks of pain, occasionally accompanied with fever, during which the pain was chiefly referred to the insensible parts. There were frequent attacks of inflammation of the left eye, with dimness of the cornea, which were relieved from time to time by the usual antiphlogistic means; but at the end of two months, a line formed round the base of the cornea, which at length sloughed out, and the contents of the eye were entirely discharged. The muscles of the left side of the jaw were paralytic, and felt quite flaccid when the patient chewed or clenched the jaws, but the motion of the muscles of the cheek was unimpaired. After the destruction of the eye, the paralytic symptoms remained stationary for a year or more, there was then a violent return of headache, with fever, and death in a state of coma, after an illness of a fortnight.

On inspection, there was found considerable ramollissement of some of the central parts of the brain. The fifth nerve of the left side, on being traced backwards from the ganglion, was found, close to the ganglion, to be of a very dense texture, but beyond this it was much wasted, and at its junction with the tuber annulare, nothing but membrane seemed to remain.[7]

Case 874.—A young man, an epileptic in the hospital *La Pitié*, died on the 12th of August 1824, after having been under the care of M. Serres for ten or eleven months.

When admitted into the hospital, he complained, in addition to epileptic seizures, of slight inflammation of the right eye. The inflammation increased, the cornea became opaque, and sight, at first disordered, was ultimately lost by this cause. The organs of sense, on the right side, became successively deprived of their natural powers. This took place in June 1824. The right eye, eyelids, nostril, and half of the tongue, were deprived of sensation, while the same parts on the left side possessed it perfectly. Shortly after, the disease was aggravated by a scorbutic affection, which first manifested itself on the right side of both maxillæ, on this side laying the teeth bare by an affection of the gums. In the advanced stage of this disease, complete deafness took place on the right side.

On dissection, the ganglion of the fifth nerve on the right side was found to be swollen, of a yellow colour, and less vascular than usual, and the nerve, where it seems inserted into the pons Varolii, was changed into a yellow gelatinous substance, like the ganglion, which substance transmitted small processes into the pons, in the direction of the fasciculi of the insertion of the nerve. The muscular branches of the affected nerve were unaltered, and the action of mastication had never been disturbed.[8]

Treatment.—The causes of anæsthesia are not generally of a nature to yield to treatment. Romberg relates[9] a case, however, in which the disease, being probably rheumatic in its origin, yielded to the free internal and external use of iodide of potassium; while in a case recorded[10] by M. James, the symptoms were removed by the repeated application of galvanism to the different points affected.[11]

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[1] On the experiment of dividing the fifth nerve, and its effects on the eye, consult Alcock, Cyclopædia of Anatomy and Physiology; Vol. ii. p. 309; London, 1837. While Magendie acknowledges that the alterations in the nutrition of the eye from dividing the nerve are less as the section is further from the orbit and nearer to the root of the nerve, Alcock is of opinion that the violence inflicted, either in the vicinity of the eye or actually to its appendages, is the primary and immediate cause of the alterations which take place in the experiments in question.

[2] Journal Hebdomadaire des Progrès des Sciences Médicales; Tome i. p. 368; Paris, 1836.

[3] Romberg's Manual of the Nervous Diseases of Man; Vol. i. p. 195; London, 1853.

[4] Bell's Nervous System of the Human Body; Appendix, pp. xxiii., lxxvii., lxxx., xciii., cv.; London, 1830: Mayo's Anatomical and Physiological Commentaries; No. 2, p. 12; London, 1823: Stanley, London Medical Gazette; Vol. i. p. 531; London, 1828: Montault, Journal Générale de Médecine, Avril, 1829: Carron du Villards, Journal Complémentaire des Sciences Médicales; Vol. xliv. p. 13: Bishop, Medical Gazette; Vol. xiii. p. 463; London, 1833: Burton, Ibid.; Vol. xvi. p. 366; London, 1835 · Dixon, Medico-Chirurgical Transactions; Vol. xxviii. p. 373; Vol .xxix. p. 131; London, 1845, 1846.

[5] Bell, Op. cit.; Appendix, p. xcviii.; London, 1830.

[6] Ibid., p. c.

[7] Abercrombie's Pathological and Practical Researches on Diseases of the Brain, p. 447; Edinburgh, 1829.

[8] Serres, Anatomie Comparée du Cerveau; Tome ii. p. 67; Paris, 1827.

[9] Op. cit.; Vol. i. p. 215.

[10] Quoted from the Gazette Médicale de Paris, Octobre 24, 1840, in the British & Foreign Medical Review, April 1841, p. 524.

[11] On anæsthesia of the fifth nerve, consult Romberg, Op. cit.: Radclyffe Hall, Edinburgh Medical and Surgical Journal; Vol. lxx. p. 1; Edinburgh, 1848: Cowan, Glasgow Medical Journal; Vol. ii. p. 146; Glasgow, 1853.

CHAPTER XXVI.

AMAUROSIS.

SECTION I. — GENERAL ACCOUNT OF AMAUROSIS; ITS DEFINITION, SEATS, CAUSES, SYMPTOMS, STAGES AND DEGREES, DIAGNOSIS, PROGNOSIS, AND TREATMENT.

Syn.—Amaurosis, from ἀμαυρὸς, *obscure.* ’Αμϐλυωπία, *Hippocrates.* Μελανία, *Aristotle.* Gutta serena, *Latino-barbarous translators from the Arabic.* Nervous blindness; Optic anæsthesia, *Romberg.* Der schwarze Staar, *Ger.*

I. *Definition.* — By amaurosis is meant *obscurity of vision,* depending on a morbid condition of one or several portions of the optic nerve — its root, its course, or its termination. It is an effect, therefore, depending upon causes entirely different from those which prevent the rays of light from entering the eye, or passing through it to the retina.

If, in consequence of morbid changes, the retina be no longer capable of being duly impressed by external objects through the medium of light, if the optic nerve be unable to convey to the sensorium the impressions made upon the retina, or if the brain be deprived of the power of receiving the impressions conveyed by the optic nerve, the individual must suffer an obscurity, or a total loss of sight, according to the degree of inability in these several parts to execute their functions. Even when he goes no farther into the subject than this, the reader must see the necessity of distinguishing different cases of amaurosis, according as the retina, the optic nerve, or the brain, is the part first and principally affected; although in many instances there is reason to believe all these textures to be involved.

There is a previous question, however, which ought to be settled in all cases of impaired or destroyed vision; *viz.* Is there sufficient cause for the symptoms in those parts of the eye which lie in juxtaposition with the retina, namely, the vitreous humour and the choroid, independently of any primary affection of the retina, optic nerve, or brain? The oculist should attend to this, and not wander into a field of uncertainty, such as encephalic diseases but too often prove, when, perhaps, a sufficient explanation of the symptoms lies open to him in the state of the eyeball itself. It will be evident, on the slightest consideration, how necessary it is to distinguish glaucoma from amaurosis, were it for no other reason than that the patient may be saved from the pain and other evil effects of remedies which can be of no service, but on the contrary may injure his constitution, and must at all events disappoint his hopes.

II. *Seats.* — In order to prevent, if possible, our falling into false notions regarding the seats, as well as the symptoms, of amaurosis, it may be proper to recall to mind the following anatomical and physiological facts.

1. The optic nerves originate, a little behind the middle of the cerebral mass, from the corpora quadrigemina; and are, therefore, in communication with the posterior part of the medulla oblongata. The broad slip of medullary substance or

tractus opticus, by which the nerve on each side appears to commence, turns round upon the outer edge of the thalamus and adheres to it, crosses and adheres to the crus cerebri, attaches itself to the middle lobe of the cerebrum, becomes intimately connected with the floor of the third ventricle formed by the tuber cinereum, and unites with its fellow of the opposite side, to form the chiasma.

2. Numerous cases on record, in which atrophy of one of the optic nerves has been traced from a diseased eye to the opposite side of the brain, fully establish the fact of at least a partial decussation of the optic nerves in the chiasma.[1] The outermost fibres of each nerve appear to continue their course toward the orbits without crossing; probably the innermost fibres pass from the one side to the other. (See p. 997.) This arrangement explains the apparently contradictory evidence, afforded by pathological preparations, such as those preserved in the Museum of the Richmond Surgical School, Dublin, and referred to by Dr. Mayne.[2] These preparations belonged to cases, in which one eye had been destroyed either by local disease or accident, many years previous to death, and where in consequence the corresponding optic nerve had become wasted, while the opposite one continued healthy. In the majority of the specimens, the wasting had been propagated backwards to the opposite tractus opticus, while the corresponding tractus had been spared; in some examples, both tractus optici had suffered a diminution of size, and in general to an unequal amount; and in one very remarkable instance, the tractus opticus of the same side with the shrunken nerve had dwindled into a narrow band, while the other retained fully its natural dimensions.

3. There is no proportion, and but slight connexion, between the optic thalami and the nerves of vision. In the horse, ox, sheep, &c. the optic nerves are as large as in man, but the thalami in man are much larger than in those animals. On examining the structure of the thalamus, a merely superficial layer of it is found to be attached to the optic nerve, while the whole of its interior fibres diverge backwards into the cerebral convolutions. When the optic nerve is affected with atrophy, the corresponding thalamus is diminished only in so far as the nerve itself has shrunk; the interior of the thalamus suffers no change, but the atrophic state of the nerve may be traced back to the corpora quadrigemina. In the brain of a woman who had died insane, Dr. Spurzheim[3] found the thalamus of the left side half-converted into pus, the corpus striatum of the same side much shrunk, but the optic nerve healthy, and resembling in all respects its fellow of the opposite side, in the vicinity of which no organic change could be detected. The anterior pair of quadrigeminal bodies were also in their natural state. In one instance, Dr. Parry[4] found the thalami nearly obliterated, with the optic nerves healthy. Numerous cases might be quoted of disease in the thalami, without any affection of vision.[5]

4. Each optic nerve, or at any rate each retina, is probably a plexus, derived nearly equally from the two sides of the brain. There is reason to believe that the retina is in communication with other nerves besides the optic; and that it influences them, and, on the other hand, is under their influence. The optic nerves, as has been already mentioned, are in connection with the posterior part of the medulla oblongata. The great sympathetic, by communicating with the spinal nerves, derives the power of exciting motion and conveying sensation; hence irritation of the organs supplied by the great sympathetic is communicated to the spinal cord and to the brain, and disease is excited in the cerebrum by causes existing in the thorax, abdomen or pelvis. If we trace the great sympathetic nerve upwards from the first cervical ganglion, we find that the branches of the nerve surround the internal carotid artery, passing with it into the carotid canal of the temporal bone; and that, having reached the cavernous sinus, the great sympathetic forms a ganglion, whence are derived branches which communicate with the sixth nerve, the third nerve, and the first division of the fifth. One or more branches of the cavernous ganglion communicate directly with the lenticular ganglion. Tiedemann[6] thought he traced branches from the lenticular ganglion to the retina. The internal carotid artery, as it mounts within the cranium, is still surrounded by branches of the great sympathetic nerve, which cling to it, and may be traced along its ramifications. The ophthalmic artery, with the rest, is invested with a plexus from this nerve, and in this way the arteries of the choroid, iris, and retina, are supplied with its influence. From the lenticular ganglion arise the nerves of the ciliary muscle and the iris, and Ribes[7] supposes that he has traced branches from the ciliary or iridal nerves, where they lie between the sclerotica

and choroid, penetrating the latter membrane, and running backwards into the retina.

5. When, in birds, one of the optic lobes (parts analogous to the anterior corpora quadrigemina of mammiferous animals) is wounded, the vision of the opposite eye becomes weak or extinct. If, after a time, the same experiment is performed on the other side of the brain, the eye which formerly continued sound, becomes blind.[8]

6. If the optic nerve be divided in any animal, anteriorly to the chiasma, the pupil of the eye on the same side becomes very large and motionless, and the power of vision of that eye is immediately abolished. Every trace of sensibility to light is lost, so that even on concentrating the light of the sun by means of a lens, and directing it into the pupil, not the least symptom of sensation is produced.

7. If the chiasma is divided longitudinally, blindness, with dilated pupils, is the result.

8. It is generally acknowledged that the fifth nerve communicates common sensibility to the parts to which it is distributed; and that, in consequence of the communications which it has with the great sympathetic, it exercises a very remarkable influence over the nutrition of the eye. Hence it is that injuries of the fifth nerve determine often a reflex affection of the retina, ending in blindness. The evidence in favour of the opinion of Magendie [9], that the fifth is directly concerned in vision where a special nerve exists, is altogether insufficient. If light acts in any case as an agent in exciting impressions not visual, the fifth nerve is probably the channel through which such impressions are conveyed.[10]

9. If the trunk of the third nerve be divided within the cranium of a pigeon, the pupil dilates, and cannot be made to contract by exposure to intense light. The section of the fifth nerve in the same animal produces no change in the motions of the iris. In birds, the third pair supplies the whole of the nerves of the iris. When the optic nerves are pinched within the cranium of a pigeon, the pupils contract. The same result follows a similar irritation of the third pair, but not that of the fifth. When the optic nerves have been divided within the cranium of a pigeon, if the portion of the nerves attached to the eyes be pinched, no contraction of the pupil ensues; but if the portion adhering to the brain be pinched, a like contraction of the pupil ensues as if the optic nerves had not been divided. If the third pair has been divided, no change in the pupil ensues on irritating the entire or divided optic nerves. From these facts, it may fairly be concluded, that in the habitual variations of the pupil, an impression is conveyed along the optic nerve to the brain, which is followed by an affection of the third nerve, causing the pupil to contract or dilate.[11]

10. Pourfour du Petit was the first to observe, that in those animals where the great sympathetic is so closely connected to the vagus, that the latter cannot be divided in the neck without dividing also the former, the result of such experiment is, that the conjunctiva becomes red and swollen, the third eyelid is projected over the cornea, the pupil becomes contracted, and only a small part of the eyeball is seen between the half-closed eyelids. These effects he justly attributed to the division of the trunk of the great sympathetic.[12] Similar experiments, by many succeeding observers, and especially the extirpation of the superior cervical ganglion of the great sympathetic, have led to the conclusion, that while contraction of the pupil is owing to the stimulus conveyed to the sphincter fibres of the iris, through the third nerve, the stimulus for contraction of the radiating fibres, by means of which the pupil is expanded, is dependent on branches from the spinal nerves, passing through the superior cervical ganglion of the great sympathetic. A remarkable fact, recently announced by M. Bernard is, that if the central end of the divided nerve is galvanised, the pupil contracts, and the muscles of the face, previously contracted, become relaxed.[13]

From these anatomical and physiological facts, the reader may easily conclude, that a strict inquiry into the seats and symptoms of the different varieties of amaurosis, will necessarily embrace a field of considerable extent, and that he need not be surprised to meet, in the course of such inquiry, with many things which may appear inexplicable, or even contradictory.

Vision is completed in the retina, optic nerve, and optic tubercle, and these are the parts, one or other of which must always suffer in amaurosis. At the same time, it happens in many cases that the organic change upon which this disease depends, does not primarily affect those textures, but some of the surrounding ones, or even textures which are remote from the organ of vision. The membranes of the brain, for example, may give rise to a tumour, which may press, through the medium of the brain, upon the optic apparatus. The uterus, suddenly ceasing to discharge the catamenia, may lead to an over-charged state of the cerebral vessels, and this may cause an amaurosis. Hence the distinction of idiopathic, symptomatic, and sympathetic amaurosis.

Amaurosis may be, 1. Sensorial, having its seat in the retina, optic nerve, or optic tubercle; 2. Cerebral, as when it arises from diseases in the hemispheres of the brain, water in the ventricles, or tumours attached to the dura mater; 3. Spinal, when it springs from disease of the fifth nerve, and is attended by ocular anæsthesia; 4. Ganglionic, as when affections of the digestive or the generative system give rise to it.

III. *Causes.*—*I. Efficient causes.* Amaurosis may depend simply on *pressure* communicated to the retina, optic nerve, or brain, or on some *organic change* originating in one or other of these parts. It is on this two-fold principle, that I shall afterwards classify the efficient causes of the disease.

1. Congestion, or inflammation, primarily affecting any portion of the nervous optic apparatus, or the secondary effects of inflammation, or its tertiary effects (see p. 415) on the brain, its membranes, the optic nerve, or the retina, may cause amaurosis. It is possible that amaurosis may sometimes be the product of disorders originating in the nervous substance of the optic apparatus; but there is reason to think that much more frequently disorders of the sanguiferous system, operating on the nervous substance, cause the disease. It is plain that no sensorial function can be carried on in a perfect state, without the due co-operation of the sanguiferous and nervous systems. Of diseases essentially nervous, we know very little; the greater part of the morbid affections of the nervous system with which we are acquainted, originate in vascular derangements.

The organic changes which directly produce amaurosis are, in general, congestion or inflammation in its primary stage, or some of the secondary or tertiary effects of inflammation, such as suppuration, ulceration, induration, ramollissement, hypertrophy, atrophy, &c. Such changes may be either removable, as simple congestion, or inflammation in its first stage, or permanent, as ramollissement, atrophy, &c.

2. The cause of amaurosis is evidently, in many cases, pressure, impeding the communication of nervous influence, and of vascular support. Pressure may produce amaurosis immediately or mediately. An enlarged pituitary gland will press directly on the optic nerves; a tumour attached to the tentorium will press indirectly on the optic apparatus. Pressure by an exostosis, or other tumour, is a thing with which we are familiar; a gorged state of the blood-vessels we also regard as a cause of pressure; and even when amaurosis is the result of inflammation, it can scarcely be doubted, that the optic ap-

paratus suffers pressure, rendering it incapable of fulfilling its proper functions. Of the proximate cause of those diseases, which are generally attributed to compression of the brain, Sir Charles Bell has promulgated a view somewhat different from the common, maintaining that what is called compression in this instance, operates not on the substance of the brain itself, but simply by preventing that due supply of arterial blood, which is necessary for the performance of the cerebral functions.[14] There can be no doubt, however, that where the bulk of any part of the body is diminished by compression, the effect is an increased activity of the absorbents, as well as a diminished supply of blood; so that the tissues are wasted, and cannot be repaired.

Amaurosis always results from an *organic cause,* existing in the optic apparatus, or in the surrounding parts. The notion of such a thing as a *functional* or *dynamical* amaurosis may perhaps have originated in the hypothesis, entertained by many, that mental disorders are often functional merely, and not dependent on any structural derangement of the brain. This hypothesis, which even in respect to mental affections is probably unfounded, has been still more unwarrantably extended to sensorial disorders. While we acknowledge, that amaurosis is occasionally sympathetic, or arises in consequence of derangement of some remote organ, and that it is in some rare instances sudden in its attack or in its departure, yet it cannot admit of doubt, that, in all cases, even the sympathetic, the loss of sight must depend on some change affecting the substance of the optic apparatus, and cannot result from any merely irregular distribution of nervous energy. Take, for example, the amaurosis which arises from the presence of worms in the bowels. The brain, of perhaps not more than one out of a thousand affected with worms, is so susceptible of disease, that the irritation communicated to it from the bowels, is sufficient to produce in it that morbid condition which causes dilatation of the pupils and loss of vision; but that the amaurosis, in these cases, is the consequence of anything else than a certain alteration in the structure of the optic apparatus, is a proposition which scarcely deserves a serious refutation. Neither can it be admitted, when amaurosis occurs suddenly, as a disease of relation, that it is independent of organic derangement, however indubitable it may be that the first link in the chain of causes has existed in some remote part of the body.

The change which a diseased organ suffers, and by which its function is deranged, may be transient and curable, or it may be permanent and incurable; but this is no good ground for styling the former disease *functional,* and reserving the name *organic* for the latter, much less for maintaining the absurdity, that a function may be deranged although the organ of the function is sound. Amaurosis from vascular derangement is styled functional; from a tumour in the brain, organic; whereas the former is as truly organic as the latter. In congestion or in inflammation, not only are the vessels changed in diameter—the very important organ which they contain, viz. the blood, is changed—and in the parts around, there are often, if not always, molecular changes of the greatest importance.[15]

II. Remote causes. Amaurosis springs from many and various predisposing and exciting causes.

When a strong predisposition to the disease exists, a slight exciting cause may bring it on. Many fatigue their eyes in viewing minute objects; but out of perhaps 500 of these, only one shall become amaurotic, in whom a stronger predisposition to the disease had existed. When there is no predisposition, exciting causes which in other circumstances would have produced amaurosis, may have no effect. In some, the force of the predisposing cause, not that of the exciting, produces the disease; in other cases, it is the reverse. Either cause may be so obscure, as to escape detection; both may be inscrutable.

1. We meet with instances of hereditary predisposition to the disease; so that several members of the same family, or of successive families, lose their sight, about the same period of life. Beer knew several families who had a hereditary tendency to amaurosis. In one of them, even through three successive generations, all the females who had not borne children, became blind when they ceased to menstruate. The males of this family, who as well as the females, had dark-brown eyes, also showed a decided tendency to the disease, although none of them lost their sight.[16] Innate or inherited causes predisposing to amaurosis, occur oftenest in those of a melancholic, and less frequently in those of a sanguine temperament. Scrofulous subjects, with dark eyes and hair, are apt to suffer from such predisposition.

2. Over-exertion of the sight, exposure to bright light, or great heat and light, either natural or artificial, occupation upon minute objects, and employment of the eyes during the hours which ought to be devoted to sleep, form a set of causes which are extremely productive of amaurosis. In many instances, a single imprudent exposure of the eyes to the operation of some such cause as those now mentioned, has been sufficient to extinguish the sensibility of the retina; but, in general, it is from long-continued over-excitement of the organs of vision, that they begin to fail, and at last become totally unable to continue their office.

3. A third set of predisposing and exciting causes are such as directly or indirectly promote determination of blood to the eyes, or sanguineous congestion, inflammation, or serous effusion, in the head; such as insolation, rage, forced exertions of the body, occupations which require continued stooping, errors in diet, and especially the abuse of wine and spirits, retrocession of eruptive diseases, suppressed discharges of blood, perspiration, pus, &c. interruption or entire cessation of the menses, and slowness of the bowels. Typhus fever, from its congestive effects on the brain, often leads to amaurosis.

4. The operation of poisonous substances sometimes produces a sudden attack of amaurosis. Belladonna, stramonium, and some other narcotics, in large doses, are almost immediately followed by this effect. Other poisonous substances, applied to the body, in small quantities every day, or several times every day, are probably productive of a similar effect, only that they operate more slowly. Tobacco may be justly signalised as a poison of this sort; but many

others, and, in particular, mercury and lead, have been accused of an insidious operation on the nervous system, terminating in blindness.

5. Gastric and intestinal irritation, acute or chronic, is in many instances the forerunner of amaurosis, and evidently operates as its exciting cause, either by impeded and deranged assimilation, or through the medium of the great sympathetic nerve.

6. Exhaustion of the body, such as that which arises from poor and unwholesome diet, chronic diarrhœa, neglected leucorrhœa, prolonged suckling, manustupration, excessive venery, and the like, is a frequent cause of amaurosis. There is reason to believe that local congestions and inflammations may accompany the state of general weakness, produced by the causes here enumerated; and from such local affections, ending in atrophy of the optic apparatus, the amaurosis which occurs under such circumstances, probably takes its origin. Depressing mental affections, grief, care, and melancholy, operate in the same way in producing the disease.

7. Blows on the head, injuries of the branches of the fifth nerve, and even mere irritation of this nerve, have sometimes proved the remote causes of amaurosis.

8. Those who have suffered from scrofulous or other chronic ophthalmiæ in childhood, or from other scrofulous diseases, are very liable to become amaurotic, after they begin to use their eyes in earnest, or later in life, and especially if exposed to one or more of the unfavourable influences above enumerated.

III. Complication of causes. Amaurosis is, in general, a disease by no means simply constituted, or of which the causes are easily and satisfactorily explicable. If we investigate with care the history of the cases of amaurosis which come before us, we shall find that the disease can seldom be attributed to the influence of any single remote cause; but that most frequently a number of circumstances favourable to the rise and progress of an amaurotic affection, have for a length of time been acting on the individual, either consecutively, or together. It is chiefly the combination of manifold and complex causes, which at once renders it so difficult to discriminate with correctness between the different species of amaurosis, to classify them, and in many cases, to decide on a proper line of treatment, and which but too often serves also to frustrate the cure, even when the remedies are judiciously selected, and carefully applied.

IV. *Symptoms.*—The symptoms of amaurosis are *essential* or *accidental.* Such symptoms as neuralgia, hysteria, epilepsy, &c., are accidental in many cases to amaurosis; and, on the contrary, amaurosis is often accidental to these diseases. The distinction must be carefully attended to in practice. From the concurrence of accidental symptoms, a great degree of perplexity may arise, if they are not distinguished from those which are essential.

The essential symptoms of amaurosis naturally arrange themselves into two classes; the *objective* or *anatomical,* and the *subjective* or *physiological.* The former class includes those which the *observer* discovers in the form, colour, texture, consistency, vascularity, and mobility of the different parts of the organ of vision, or in the general health of the patient; the latter, those which the *patient* himself experiences, and which must be admitted very much upon his own testimony, as impaired and deranged vision, headache, giddiness, &c. In general, it is advisable in examining any case of amaurosis, first to attend to the objective, and then to the subjective symptoms. Each eye ought also to be inspected separately, while the other is excluded from the light. Even in the history of his loss of vision, we ought to confine the patient to one eye at a time, unless both appear to have become affected at the same period, and from the same cause.

I. Objective symptoms. 1. The first symptom, which, in general, attracts the attention of an experienced observer, is the gait and cast of eye, of the amaurotic patient. He advances towards us with an air of doubt and uncertainty in his movements, from which the cataractous patient is generally exempt, and instead of converging his eyes in the natural way towards an object, it is evident that there is something vacant and unmeaning in his look, the result of the eyes being directed parallelly, as if towards an object infinitely distant. If one eye only is affected, it appears to diverge from its fellow. This cast of the eyes, which Richter[17] appears to confound with squinting, may exist, indeed, only in a very slight degree. It is, however, as that author well observes, the only objective sign of amaurosis, which never fails to be present, a fact peculiarly valuable, in cases where we have reason to suspect simulation. In some cases of amaurosis, there is not merely the want of direction and control of the eyes, of which we are now speaking, and which is the consequence of deficient sensation, but there is actual strabismus, a symptom which coming on after considerable loss of vision, with pain in the upper part of the forehead, points to organic disease within the cranium. In many cases there is oscillation, and in some the eyes stand completely fixed in the head.

The motions of the lids also, as well as those of the eyes, are not unfrequently impeded; in some, the levator of the upper lid, and in others, the orbicularis palpebrarum, being partially or completely palsied, according as the motor oculi or the facial nerve is prevented from communicating its influence to the muscles which it supplies.

2. Besides the movements of the eyes, their prominence, size, colour, consistence, and form, deserve attention. We often observe them unnaturally prominent, or the one more prominent than the other; they are not unfrequently small, an effect of scrofulous ophthalmia in childhood; their colour is seldom that of the healthy eye, the sclerotica being frequently of a yellowish hue, sometimes bluish or ash-coloured, and often covered with varicose vessels running either in straight lines or tortuously towards the cornea; while there are few symptoms of amaurosis so certain as a change in the consistence of the eyeball, it being either considerably firmer to the touch, or greatly softer than natural. In some instances, we find the eye flattened on one or several of its sides.

Some of these changes may be considered as causes and others as effects of amaurosis. The loss of the special function of an organ of sense often leads to an enfeebled state of its organic functions. The consequences are a set of *secondary* changes, which must not be confounded with those, which, being the cause of the loss of sensibility, may be called *primary*.

3. Sluggish and limited motion of the pupil, or entire loss of motion, often attended with dilatation, forms one of the most remarkable symptoms of amaurosis. The early and incomplete stages of amaurosis are rarely accompanied by widely dilated pupils, but only by sluggishness and a limited degree of motion. After the perception of light is altogether extinct, the opening is generally found expanded and quite motionless. If the pupils are widely dilated and fixed, with the eyeballs of normal consistence, and the humours clear, there is probably hydrocephalus, or pressure from an enlargement of the pituitary gland, or from some growth far forwards on the base of the brain. If the pupils are in a middle state of dilatation, but irregular, and sluggish, and limited in their motions, and especially if this state is accompanied with glaucoma and with discolouration of the iris, it is probable there exists congestion or inflammation of the retina or of the optic nerve, or that there is a state of atrophy extending along the optic nerves within the cranium. In this case belladonna has little effect in dilating the pupils. If one pupil is widely dilated, and does not move with the other pupil, there is pressure in or behind the orbit, involving the third nerve as well as the optic of the same side. That a dilated state of one pupil is not always connected with pressure on the brain, nor even with any cerebral disease, is evident from the fact, that it is sometimes induced simply by a blow on the eye.

There are two other facts regarding the motions of the pupil in certain amaurotic cases, which have attracted much attention. The first is, that the pupil of a completely amaurotic eye will often move briskly, according to the degree of light acting on the opposite or sound eye, while, if we expose the amaurotic eye by itself, its pupil remains perfectly motionless, and much dilated. The second fact, and one accounted still more extraordinary, is that in some cases, where the patient is totally blind, both pupils, according to the intensity of light to which the eyes are exposed, vary in diameter exactly as in health.[18]

The latter of these facts has hitherto received no probable explanation; for although the direct influence of light [19] has some effect in causing motion of the iris, the effect is too small to explain the extensive motions of the pupil in such cases, while the idea [20] of the iris acting, by a sympathy with the retina, independent of the brain, is altogether contrary to the physiology of the iris, as founded on experiment. It appears to be absolutely necessary for the ordinary motions of that membrane, not only that the iridal or ciliary nerves, and one or other or both retinæ be sound, but that a certain degree of communication shall be kept up, on the one hand, between one or other or both retinæ and the brain, and between the brain and the iridal nerves, on the other. It becomes, then, a question, whether the brain may not be so affected with disease, as to be incapable of acting as the organ of visual perception, and yet retain the power of communicating to the third nerve the impulse necessary for the usual motions of the pupil. If we suppose that the function of vision is accomplished only after the optic nerves reach the corpora quadrigemina, and thus communicate with the posterior part of the medulla oblongata, but that the association which undoubtedly exists between the optic nerves and the third pair, is effected farther forward on the basis of the brain, we shall be able to afford at least a plausible explanation of the fact of the lively mobility of the pupils in certain cases of complete amaurosis. The third pair makes its appearance immediately behind the tuber cinereum, a part of the brain with which the optic nerves have a manifest connexion. The third pair does not, indeed, appear to take its origin from the tuber cinereum, but from the central cineritious substance of the crura cerebri, bearing an analogy, along with the sixth and ninth pairs, the portio dura of the seventh, and the portion of the fifth pair which escapes the Gasserian ganglion, to the anterior roots of the spinal nerves; but it is surely not an improbable supposition, that the optic nerves, either where they cross the crura cerebri, or more probably, where they communicate with the tuber cinereum, form that link of connexion with the third pair, which they are universally acknowledged to do in some part or other of their course. A disease, then, affecting the corpora quadrigemina, or, in other words, the origin of the optic nerves, or affecting any part of the tractus opticus between the corpora quadrigemina and the communication between the optic nerves and the third pair, wherever that communication is effected, will, according to this view of the subject, produce blindness, but may leave unimpaired the influence of the optic nerves upon the third pair; while the cases of amaurosis, in which the pupils are fixed and dilated, are probably owing, either to more extensive disease, or to disease so situated as to affect that part of the brain where the optic nerves communicate their influence to the third pair. Amaurosis, with lively pupils, has not unfrequently been found to depend on disease of the cerebellum.[21]

If the above be the true explanation of the activity of the pupils, which sometimes exists in cases of total blindness, it will also serve to account for the motions of the iris of an amaurotic eye, when the opposite sound eye is exposed to various gradations of light. The right eye, we shall say, is healthy, but the left, on account of some morbid change in the retina, or in that portion of its nerve which extends from the retina to the chiasma, is blind. Still the right optic nerve, dividing at the chiasma into two portions, one to the right and the other to the left side of the brain, is in communication with both nerves of the third pair, so that although the pupil of the diseased eye becomes expanded and fixed when the sound eye is kept shut, it instantly contracts when this eye is exposed to light, and so long as this is the case, performs exactly the same motions. This view of the matter appears to be confirmed by the case of a patient at the Glasgow Eye Infirmary, in whom the retina, in consequence of an injury of the eye received some years before, was thickened, opaque, and separated from its natural contact with the choroid. The lens lay in the anterior chamber, and was removed by extraction, but the eye remained perfectly insensible to light. When the diseased eye was separately exposed to light, its pupil stood fixed and dilated; but when both were exposed, the pupil of the amaurotic eye moved briskly. We had no reason to believe that, in this case, there was any other part diseased but the retina.

Besides the motions of the iris, which of course must be examined, as has been already mentioned, in each eye separately, and with the opposite eye excluded from light, there are various other particulars respecting the iris, which deserve attention; especially, the form and situation of the pupil, and the inclination of the iris, for sometimes the pupil is very irregularly dilated, at other times it has evidently shifted from its natural place towards one or other part of the circumference of the iris, while this membrane itself is in some cases observed to be bulging towards the cornea, and in others to have sunk back, so as to present anteriorly a concave or funnel-like form.

4. A point of great importance in every case of amaurosis is the appearance and consistence of the humours. In some instances, when, for example, the disease is hydrocephalic, and occurs in a young subject, the pupil presents its natural black hue, but in elderly subjects, it is rarely the case that some degree of glaucoma does not accompany amaurosis. Such a complication must, of course, render the prognosis much more or altogether unfavourable; although, at the same time, it must be confessed, that some of the most hopeless cases of amaurosis are attended with a perfectly healthy state of the humours, the cause residing, not in the eye, but in the cavity of the orbit or within the cranium.

5. When the pupil is either morbidly expanded, or dilated by a drop of atropine, it may be possible, by concentrating the sun's rays or the strong light of a lamp or gas flame with a double convex lens, and letting the focus fall within the eye, to discover in some cases pigmentary depositions in the vitreous humour, effusions of blood or exudations of lymph on the surface or in the substance of the retina, or between it and the choroid, varicosity of the retinal vessels, partial removal of the pigment in patches, separation of the retina from the choroid in consequence of sub-choroid dropsy, &c. The same may be accomplished by means of a beam of strong light, reflected from a mirror, as is done by the ophthalmoscopes of Helmholtz, Coccius, and others. Such examinations may confirm us in an unfavourable prognosis, already pronounced on other grounds, but are not likely to be either satisfactory or safe in the early and curable stages of the disease.

6. It is proper to observe, whether there be any cicatrices about the face or head of amaurotic patients, marking the previous occurrence of such injuries as may either, by affecting the branches of the fifth pair distributed externally, have ultimately brought on a reflex disease of the optic apparatus, or have more directly induced pressure on the brain, inflammation of its membranes, cerebral effusions, or morbid formations within the head. (See page 115.)

7. The age, general aspect, and physical and moral constitution of the patient must be regarded with attention. We find all sorts of persons amongst the amaurotic; from him whose vessels seem on the point of bursting with plethora, and who has long revelled in the

solid luxuries of the table, down to the emaciated victim of famine or of inebriety; all ages, all ranks, and professions; and not unfrequently it happens, that by directing our attention to the history of the individual's mode of life, his pursuits, his habits, and the diseases he has previously suffered, we are enabled to detect the circumstances which have been the predisposing or exciting causes of his present complaint, and by the careful avoidance of which, for the future, the cure may be greatly promoted. In many cases, perhaps in most, amaurosis is only part of a general disorder of the nervous system, or of the entire health. Observation of the pulse may throw much light on such cases. A very slow pulse, for example, will naturally lead to the suspicion of some chronic disease of the brain or of the heart. As amaurosis is rarely attended by fever, quickness of the pulse will immediately direct attention to the state of the general health.

ii. Subjective symptoms. 1. The most important of the subjective symptoms is impaired vision. The progress of this symptom, and the degree it attains, vary in different cases; for in some instances the patient becomes suddenly and permanently blind, while, in others, the sight fails gradually during months or years, without ever terminating in total loss of sight. Hence the distinctions of *sudden* and *slow*, *complete* and *incomplete* amaurosis.

In the commencement of the disease, it often happens that the failure of sight is observed only occasionally, occurring, perhaps, but seldom, and only for a short time (*amaurosis vaga*), assuming the form of *night-blindness* or of *day-blindness*, or coming on regularly after any continued exertion of the eyes in the perception of minute or luminous objects. Sometimes the patient begins by finding that with both eyes he sees confusedly, and better with one open and the other closed (*monoblepsis*). *Diplopia* is often the first symptom. Many an amaurotic patient can read with ease a few lines of a printed book, after which the letters appear so confused, and the effort to see them is so painful, that he is obliged to desist (*asthenopia*). Sudden and temporary attacks of blindness are often connected with gastric derangement, and are entirely removed by correcting the state of the digestive organs; but it must also be confessed that such transient attacks are sometimes the effect of incipient diseases in the brain, of the most formidable kind.

The failure of sight in some cases extends to the whole field of view, and in others only partially affects it. On attempting to read, for example, more or less of the page appears indistinct. Perhaps the patient loses sight of a word only here and there (*visus interruptus*), or he sees only one-half of the page, while the other half is as if hid from his view (*hemiopia*). It not unfrequently happens that an amaurotic eye will still discern certain objects, if they are placed in one particular direction (*visus obliquus*); but if by the slightest movement of the eye or head, the person once loses sight of the object, he finds that he cannot easily recover the same point of vision. If the patient looks towards an object, it often happens that he does not see it, it is immersed in the amaurotic cloud; but if he directs his eye to some other object, situated above or below or to one or other side of the first, this comes into view. This oblique vision is at first of little use to the patient, but gradually the eye contrives to make it more steady and beneficial. Sometimes the patient catches sight of an object while it is in motion, but sees almost nothing that is at rest. Some amaurotic patients see all objects disfigured, bent, mutilated, lengthened or shortened (*visus defiguratus*). The flame of a candle sometimes appears very long to such patients, and as if separated into several portions.

The failure of sight in amaurosis occasionally assumes somewhat of a *myopic* or *presbyopic* form. I have known a confirmed amaurotic patient see large objects with considerable distinctness, through a double-concave glass of 12 inches' focus; and another patient who, totally blind in the right eye, and with the left fast hastening to the same state, could still with the latter read an ordinary type, by the aid of a double-convex glass of seven inches' focus.

To an amaurotic eye, the size of objects sometimes appears much smaller than to the sound eye. The comparison may be made by gently pressing aside one eye, so as to produce double vision, when the image belonging to the left eye will appear to the right hand, and *vice versâ.* It has been concluded, from the diminished size of the object as seen by the amaurotic eye, that it is not merely by the size of the image on the retina, that we judge of the dimensions of objects, but that our perception of magnitude is modified by the state of the retina.[22]

2. Intimately connected with the failure of sight in amaurosis, are the various false impressions of which the patients complain; for although many maintain that they have no sensation of anything intervening between them and objects, and are not distressed by any sort of spectra, yet, in other cases, amaurosis is more or less attended by the disorders described in a preceding chapter under the heads of *photopsia, chrupsia, accidental colours,* and *muscæ volitantes.* Photopsia, in particular, is apt to occur at the commencement of the disease in plethoric individuals, and floating muscæ in dyspeptic subjects. As the disease advances, the field of vision seems to become obscured by a cloud (*visus nebulosus*), or network (*visus reticulatus*), the latter generally appearing grey or black, especially in a good light, or over any white substance, but sometimes becoming luminous in the dark, and assuming a bluish-white colour, like silver, or reddish-yellow, like gold. This is the case, also, with *fixed muscæ,* arising from the existence of insensible patches in the retina. They appear grey or black in daylight, but glitter in the dark. Floating muscæ are merely coincident to amaurosis, and form no part of the disease; fixed muscæ are an index of the retina being partially insensible to light, and may also occur when the disease resides in the optic nerve or in the brain, although then a general cloud or blackness is more likely to overspread the whole field of view.

3. If only one eye is affected, by ascertaining at what time the patient first became liable to mistakes in those actions which require distances to be exactly distinguished, as in pouring liquor into a glass, snuffing a candle, threading a needle, &c., we may discover the date of the disease, and thence may be assisted in forming a more just prognosis. If the patient has only recently been sensible of

such mistakes, the disease is also recent, and is likely to yield to treatment.[23]

4. The feelings of the patient with regard to light deserve attention; for sometimes the early stages of amaurosis are accompanied by abnormal sensibility to light, and even pain on exposure to its influence (*ocular hyperæsthesia*), while, in other cases, there are from the very beginning a diminished sensibility of the retina, and a constant desire on the part of the patient for a more copious illumination of all objects, or a *thirst for light*, as it has been called.

5. An unwonted dryness of the eyes and nostrils is by no means an uncommon symptom in chronic retinitis and amaurosis; and it is observed, that in general great benefit is obtained in such cases if once the secretions of the lacrymal gland, conjunctiva, and Schneiderian membrane are restored.

6. Pain in the eyes, and still more frequently in the head and face, forms one of the most important symptoms in cases of amaurosis. Amaurosis, without pain, generally depends on atrophy of the optic nerves. If it be attended with headache, either constant or intermittent, there is probably some organic affection of the brain, or cause of pressure within the cranium. The seat, extent, and nature of the pain are to be carefully investigated. It is necessary to inquire whether it is general over the head, hemicranial, or confined to one particular spot; whether it is dull or acute; whether it is attended by throbbing, relieved or aggravated by the horizontal position, or by taking a deep inspiration, increased during the night, affected much by temperature, exercise, or diet; and whether it is constant, intermittent, or periodic. It is also important to ascertain whether the pain is accompanied by vertigo, tinnitus aurium, nausea, sleeplessness, a tendency to coma, and the like.

From a careful observation of the above signs, we may often arrive at a probable conclusion respecting the state of the cerebral circulation, which is often imperfect, in consequence of an altered structure of the arteries of the brain; or may obtain evidence of the existence of some deposition or formation within the head, causing pressure.

7. The state of the other senses, as well as that of sight, and the state of the mental faculties, ought to be ascertained.

If amaurosis be attended with headache and loss of smell, the cause is probably a tumour in the fossa pituitaria, or over the cribriform plate of the ethmoid bone. If amaurosis of one eye be attended with loss of hearing on the same side, and stiffness of the muscles of the face, the cause is probably a tumour attached to the posterior surface of the petrous portion of the temporal bone, or arising from the meatus auditorius internus.

If amaurosis has been followed by an affection of the mind, these diseases have probably arisen from some cause within the substance of the brain, such as an abscess or a tumour; if the affection of the mind existed first, and has been followed by amaurosis, the morbid cause has probably commenced in the membranes or on the surface of the brain, and proceeded inwards.[24] Indistinctness of the perceptions and thoughts, and weakness in the voluntary and involuntary actions, point to disease of the cineritious substance.

8. The general health, and the previous diseases of the individual, are worthy of serious consideration. Is the constitution scrofulous? Has the person suffered from venereal complaints, or long-continued courses of medicine for the cure of syphilis? Had he ever typhus fever? And if he had, how was it treated? Has he had any serious disease of the head, as phrenitis; any apoplectic, epileptic, or paralytic affection? Are there signs of softening of the brain or spinal cord? Is there any affection of the heart, such as hypertrophy or valvular disease? Has the patient been subject to hypochondriasis, or, if a female, to hysteria? Has the patient been gouty or rheumatic? What has been the condition of the digestive organs? If the patient be a female, what has been the state of the uterine system? Has the patient been subject to any periodical or long-continued discharge, which has suddenly dried up? These, and many other points, which will naturally suggest themselves to the mind of the attentive observer, ought to be made the subjects of deliberate inquiry.

V. *Forms, stages, and degrees.*—It is proper to distinguish *acute* from *chronic* amaurosis; *incipient* from *confirmed;* and *incomplete* from *complete.*

1. Almost every species of amaurosis presents in some cases the *acute,* and in others the *chronic,* form. The chronic is sometimes the concluding stage of the acute. More frequently the disease is slow and insidious in its approach and progress; and when it affects only one eye, may be far advanced before its existence is suspected.

2. In the *incipient* stage, which is generally one of congestion or inflammation, the disease is only developing itself, the patient in general is not completely deprived of sight, remedies will almost always be useful in checking the progress of the complaint, and in many cases a perfect cure will be accomplished. It sometimes happens, however, that even from the very first the blindness is complete, and the case incurable. In the *confirmed* or *inveterate* stage, which is often one of atrophy, remedies may perhaps relieve some of the attending symptoms, but will very seldom effect a cure. The patient is not always totally deprived of sight, even in confirmed cases of long standing; but often retains a perception of light and shade, or a certain degree of capability to discern different gradations of light, certain colours, and even objects well illuminated or strongly contrasted.

3. In *complete* amaurosis, the patient is unable to distinguish any object or colour whatever, and is often insensible even to the presence of light. Any degree less than this is *incomplete;* the patient distinguishes large objects dimly, and is able perhaps even to read large letters.

VI. *Diagnosis.*—It is chiefly with incipient cataract that amaurosis is apt to be confounded. On this subject I must refer to what has been said at page 739.

Glaucoma is often mistaken for amaurosis, from the circumstance of being always attended by some of the subjective symptoms of this disease; but the objective symptoms of glaucoma, such as the apparent greenness of the humours, and the hardness of the eyeball, are sufficiently remarkable to enable us in general to distinguish it from simple amaurosis. The complication, however, of amaurosis with glaucoma is extremely common. Amaurosis also occurs in combination with different varieties of cataract.

VII. *Prognosis.* — There is scarcely any disease in which the prognosis is on the whole so unfavourable as in amaurosis. When the complaint, indeed, is recent, its cause evident, and the subject under middle life, a complete cure is not unfrequently obtained. This is sometimes the case even when the loss of sight is total. Much more frequently a partial amelioration only is effected; the disease being checked, and a share of vision preserved. In confirmed cases, it rarely happens that much improvement takes place, even under the best directed treatment.

It is only when the disease is not yet complicated with any material disorganization, that amaurosis yields to treatment. But in the cases which do yield, the degree of the disease is not always slight, but often serious, and the attack not always recent, but often of considerable standing. It is chiefly in cases of an inflammatory or congestive nature, that the disease is overcome.

A sudden amaurosis is generally less unfavourable than one which has developed itself slowly. When the pupil is only slightly dilated, still moveable, and of its natural form, the consistence of the eyeball neither firmer nor softer than in health, and no glaucoma present, we may pronounce a more favourable prognosis than when the pupil is fixed in the state either of expansion or contraction, the eyeball either boggy or of preternatural hardness, or the interior of the eye presenting a greenish opacity. If the attack has been sudden, a want of power in the muscles of the eyeball or eyelids, along with the proper amaurotic symptoms, may be regarded as a sign that the cause of the disease is some general pressure within the cranium, which energetic measures will probably remove; whereas the slow succession of one amaurotic and paralytic symptom after another is more likely to arise from the progress of some incurable formation within the head.

Amaurosis in middle age is less unfavourable than it is in childhood or in old age; it is less unfavourable if the attack is acute than if it were chronic; the prognosis is bad, if the disease is hereditary, or complicated with epilepsy, or if the patient, when a child, had suffered from scrofula. Complicated with cataract, amaurosis is incurable.

VIII. *Treatment.* — It is evident, that as amaurosis is a mere symptom which we cannot attack in itself, it should be our first object, in the treatment of any amaurotic affection, to discover the efficient cause upon which it depends, and then to direct against it the appropriate remedies. As the causes are very various, and even opposite, so must also be the means of cure. In every case, however, to avoid the operation of the exciting cause, and to give the diseased organs rest, must be important. I some time ago attended a gentleman affected with such a degree of incomplete amaurosis, that he could not read an ordinary type. He refused all medical applications, and simply shaded the eyes, and did not employ them on minute objects. In the course of twelve months, he perfectly recovered.

The means of cure may be arranged in two classes, *general* and *local.*

Attention must be directed, in the first place, to the general state of the health. It would be inconsiderate indeed, to attempt the removal of amaurosis by applications of a specific or a local kind, so long as any general disorder existed, such as one of the circulating or digestive system; and to have recourse to depletory means in the feeble and emaciated, would be equally inconsistent as to give tonics and stimulants to the robust and plethoric.

i. General Means. 1. *Depletion.* When we find that an amaurotic attack is attended by signs of inflammation within the cranium, impeded circulation through the brain, or what is styled a determination of blood to the head, such as headache, vertigo, flushed countenance, photopsia, tinnitus aurium, and arterial throbbing of the temples, and that the pulse is full, and the subject young or plethoric, we will of course employ general and topical blood-letting, purge the patient, put him on low diet, and direct him to avoid all mental or corporeal excitement. It is not in cases of inflammation or of increased vascular action alone that depletion is useful, but also in cases of mere congestion. Under depletion, the capillaries gradually resume a sufficient degree of contraction to allow a renewal of the nervous influence and a resumption of the sensorial function.

If the case is purely one of pressure on the brain, from vascular distension, these means, conjoined with rest, will probably effect a cure. If along with vascular pressure, there is effusion, or even some morbid formation within the cranium, still depletion will afford to a plethoric subject the most effectual palliative relief, and act as the best preparative for other remedies, especially for the use of mercury. It is impossible to lay down any general rule regarding the point to which the bleeding and purging plan is to be carried in the treatment of amaurosis with plethora. We must equally beware of stopping short before our purpose is obtained, and the balance of the circulation restored, and of pushing the depletion so far that it becomes merely a means of weakening the patient, without promoting the cure.

2. *Mercury* has long and justly maintained a high character as a remedy in amaurosis.[25] It is probable that it aids in the cure chiefly as a sorbefacient, promoting, in particular, the removal of effusions within the cranium, and sometimes even of morbid formations. It cannot be doubted, that many of the disordered states of the optic apparatus, which end in amaurosis, are originally of an inflammatory nature; inflammation, acute or chronic, of the retina and optic nerve is often the cause of the disease, and in all such cases there is reason to believe, from what we know of the beneficial effects of mercury in other inflammatory affections of the organ of vision, that this medicine will prove more serviceable than almost any other remedy. There are, of course, cases of amaurosis, in which, from the sunken state of the patient's general health, it might prove injurious to employ mercury; neither will it always be necessary or proper, in those cases in which we judge it right to try this remedy, to salivate the patient, although in some, only salivation, continued for several

weeks, will effect a cure. Mr. Travers, speaking of mercury in amaurosis, says, "I have been witness to its power in suddenly arresting the disease in too many instances, not to entertain a far higher opinion of it than of any other article of the materia medica." [26] Mr. Lawrence's testimony is not less explicit:—"We must have recourse," says he, "to mercury, which appears to be as decidedly beneficial in these cases, as in iritis, or general internal inflammation." "When the antiphlogistic treatment," he adds, "and a fair trial of mercury, have failed, I do not know that it is possible to effect any further essential good by other means." [27]

3. *Iodine.* In adults, the preparations of iodine have proved in my hands inefficacious; but in children their sorbefacient effects have been highly advantageous.

4. *Emetics and nauseants.* That emetics should be useful in cases of amaurosis depending on gastric derangement, and that nauseants may sometimes prove serviceable, appears highly probable. Accordingly we find, that in recent incomplete amaurosis, arising from irritation in the digestive organs, Schmucker [28], Richter [29], and Scarpa [30], derived the best effects from the emetic plan of cure; and although Beer, and several later observers, have been less successful in its employment, it still deserves attention. That it is not calculated, more than any other means of cure, for general adoption, and that, in some cases, it might even prove decidedly hurtful, can form no objection to its use, where the tongue is foul, the mouth bitter, and the patient complaining of continual nausea, without being either greatly debilitated, or, on the other hand, plethoric, and inclined to cerebral congestion.

5. *Evacuants,* of different sorts, besides those already mentioned, are required in the treatment of certain varieties of amaurosis; such as *emmenagogues,* when the disease appears to be connected with impeded menstruation; *anthelmintics,* when it arises from worms; *diaphoretics,* when suppressed perspiration is the cause.

6. *Tonics,* such as cinchona, and the preparations of iron, form a class of medicines of great importance in the treatment of amaurosis. That this disease in many instances takes its origin in vascular exhaustion and nervous debility, and is corrected, or entirely removed, by the use of a nourishing diet, the cold bath, tonic medicines, and influences of a similar sort, must be well known to all who have had any considerable experience in the treatment of eye-diseases, and whose opinions are not warped by some particular hypothesis, which leads them perhaps to regard amaurosis as always depending on one kind of cause, and therefore to be cured only by one plan of treatment. It cannot be denied, that tonics would, in many cases, do harm, just as bleeding, purging, vomiting, or the use of mercury would do, if misapplied; but this is no reason why they should be indiscriminately rejected.

Many cases of amaurosis are benefited by local derivatives, such as leeches to the temples and blisters behind the ears, conjointly with the administration of general tonics. In cases with debility, Beer accused tonics, such as calamus aromaticus, cinchona, and steel, of aggravating the amaurosis, by producing an increased determination of blood to the eyes. But if the digestive functions are properly regulated, and topical derivatives employed, tonics will, in general, be found to be advantageous to amaurotic patients of feeble habit.[31]

7. *Stimulants.* Many and various internal stimulants have been employed in the treatment of amaurosis; most of them quite empirically, or on some vague idea of their possessing a power of rousing the sunken sensibility of the nerves; others again on the ground of their power to excite convulsions, which, of course, they do through the instrumentality of the nervous system. Camphor and nux vomica may be mentioned, as examples of this class of remedies for amaurosis. It is well known, that those substances, given in considerable doses, excite violent tetanic paroxysms, not only in the parts animated by the spinal nerves, but also in the muscles of the face, eyes, and eyelids. In the hope, perhaps, that they might also produce a stimulating effect on the nerves of sense, these substances, and especially strychnia (the alkaloid contained in nux vomica, and one of the most energetic of poisons) have been used internally as well as externally for the cure of amaurosis. Arnica montana, helleborus niger, naphtha, phosphorus, and a host of other drugs, of similar properties, have been given on the same principle; but it is extremely doubtful if they have been productive of the least good effect.

8. *Antispasmodics,* as opium, musk, valerian, and the like, have occasionally been used in the treatment of amaurosis, especially when this disease has been joined with epilepsy, or hysteria.

9. *Sedatives,* as belladonna, hyoscyamus, and aconite, have been tried; and I have known the first mentioned of these useful in cases where the amaurotic symptoms were attended with pain, affecting the branches of the fifth nerve. It may be regarded as a well established fact, that if we succeed in subduing the coincident disease, such as neuralgia, epilepsy, or hysteria, the amaurosis is also likely to yield.

ii. Local Means. 1. *Counter-irritation,* excited by rubefacient liniments, tartar emetic ointment, blisters, and issues, proves highly useful in almost every variety of amaurosis. A succession of blisters over the head is one of the most efficient modes of employing counter-irritation. Much advantage is also derived from stimulating friction of the forehead and temples, blisters behind the ears, or to the nape of the neck, caustic issues in the same place, a seton in the neck, a tartar emetic eruption between the shoulders, and sometimes even by still more remote applications of the same sort, as the immersion of the feet in warm water holding in suspension a quantity of powdered mustard or cayenne pepper. Magendie recommends the application of blisters and moxæ as close as possible to some branch of the fifth nerve. Many facts, he says, testify the efficacy of moxæ to the temples. Dr. Prichard recommends[32] an issue made by dividing the scalp with the knife from the summit of the forehead to the occiput, and filling the space with peas, as by far the most important method of counter-irritation. He relates a case of complete amaurosis, in which an issue of this sort was efficacious after bleeding, blistering, and mercurial salivation had failed. Small blisters to the forehead and temple, the raw surface being daily dusted with strychnia, are often employed; but I must confess that I have not witnessed any effect which could fairly be attributed to the strychnia. I must say the same with regard to friction round the orbit, with an alcoholic solution of veratria. That recoveries have followed the use of external stimulants, as strychnia and veratria, is not to be doubted; but that these substances exercise any specific effect in amaurosis, different from simple irritation, is extremely problematical.

2. *Sternutatories* have been used with some advantage, especially in cases where the mucous secretion from the conjunctiva and Schneiderian membrane appeared to be partially suppressed. Mr. Ware has published[33] a considerable number of cases, in which the chief means of cure was a mercurial snuff. He recommends one grain of turpeth mineral to be mixed with twenty grains of powder of liquorice, and about a fourth of this to be snuffed up the nose two or three times a-day. In cases where the nostrils are particularly dry, the patient may promote the efficacy of the sternutatory, by previously inhaling the steam of warm water through the nostrils.

3. *Stimulating vapours,* directed against the eyes, have been recommended, especially in cases where there are evident signs of great local debility, without any appearances of congestion or plethora. A little sulphuric ether, or aqua ammoniæ, may be poured into the palm of the hand, and held under the eyes till the fluid has evaporated; and this may be repeated several times daily. The vapour of prussic acid is entirely useless in amaurosis.

4. *Electricity, galvanism,* and *electro-magnetism* are likely to be useful only in cases of a torpid character, and free from excitement. They would be hazardous, if inflammation were present, or if they excited pain.

Electricity formerly enjoyed a considerable reputation as a remedy in amaurosis, but of late years has been very much neglected. As it is not likely to be trusted to, nor even tried, while the disease is recent, it is not to be wondered at that it should, like every other kind of remedy, prove totally inert in a great majority of the confirmed or inveterate cases, which, as to a last resource, may be submitted to its influence. The cases related by Mr. Hey[34] and Mr. Ware,[35] afford sufficient ground for believing that electricity may occasionally prove highly serviceable. Mr. Ware considers it more useful in amaurosis arising from the effect of lightning on the eyes, than in any other variety of the complaint. The mode of application is chiefly by directing the electric aura against the eyes, drawing it from them during the insulation of the patient, and sometimes by taking small sparks from the eyelids and integuments round the orbits.

Galvanism has been much lauded by Magendie. He says that in complete amaurosis, the only result from the galvanic current is that of rendering the patient indistinctly sensible to the presence of light during the experiment; but in incomplete amaurosis, galvanism, applied to the branches of the fifth nerve, has sometimes produced a perfect cure. He employs electro-puncture. This is done by passing down fine needles through any of the branches of the frontal or superior maxillary nerves; a slight pricking sensation indicates that the nerve is pierced; a galvanic current is then passed along the needles, through the branches of the fifth nerve.

The general review which we have thus taken of the seat, causes, symptoms, and treatment of amaurosis, is sufficient to show that the subject is surrounded with difficulties, and that there is a necessity for exercising the most minute and careful observation, if we hope to make any advancement in the knowledge of this class of diseases. Each individual case of amaurosis, to do it justice, would require to be considered at leisure, and in all its bearings — to be made, in fact, a subject of study. It is but too evident, that many who have written upon amaurosis, labouring probably under a distaste for what they had found to be an irksome task, namely, the investigation of complicated phenomena, have endeavoured to cut the matter short, and introduce, into a subject which does not admit of it, some easy simple arrangement of their own. Feeling themselves unable to grapple with the infinite diversities of this class of diseases, they have endeavoured to reduce the phenomena of amaurosis to some contracted notions of their own, and satisfying themselves with a few artificial distinctions, have actually discouraged the attempt to follow nature with that perseverance, without which, in a subject like this, no real progress can be made.

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[1] Josephus et Carolus Wenzel de Penitiori Structura Cerebri, p. 334; Tab. vi. fig. 2; Tubingæ, 1812: Cloquet, Pathologie Chirurgicale, p. 131; Pl. x. fig. 3; Paris, 1831.

[2] Cyclopædia of Anatomy and Physiology; Vol. iii. p. 771; London, 1844.

[3] Anatomy of the Brain, p. 80; London, 1826.

[4] Collections from the unpublished Medical Writings of C. H. Parry, M. D.; Vol. i. p. 304; London, 1825.

[5] See Bright's Reports of Medical Cases, Vol. ii. pp. 292, 615, 620; London, 1831: Andral, Clinique Médicale, Tome v. pp. 338, 483; Paris, 1833.

[6] Zeitschrift für Physiologie, Vol. i. p. 255; Heidelberg, 1824.

[7] Ribes, Mémoires de la Société Médicale d'Emulation, Tome vii. p. 99; Paris, 1811.

[8] Magendie, Journal de Physiologie, Tome iii. p. 376; Paris, 1823: Serres, Anatomie Comparée du Cerveau, Tome i. p. 331; Paris, 1827.

[9] Magendie, Journal de Physiologie, Tome iv. pp. 186, 302; Paris, 1824: Desmoulins, Anatomie des Systèmes Nerveux, Tome ii. p. 712; Paris, 1825.

[10] Alcock, Cyclopædia of Anatomy and Physiology; Vol. ii. p. 308; London, 1837.

[11] Mayo's Anatomical and Physiological Commentaries, No. ii. p. 4; London, 1823.

[12] Mémoires de l'Académie Royale des Sciences, pour 1727, p. 1; Amsterdam, 1733.

[13] Valentin, De Functionibus Nervorum Cerebralium, p. 109; Bernæ, 1839: Reid's Physiological, Anatomical, and Pathological Researches, p. 291; Edinburgh, 1848: Gazette Médicale de Paris, 4 Decembre, 1852, p. 775.

[14] Institutes of Surgery, Vol. i. p. 176; Edinburgh, 1838.

[15] On the pretended distinction of amaurosis into functional and organic, see Edinburgh Medical and Surgical Journal, October, 1851, p. 318.

[16] Lehre von den Augenkrankheiten, Vol. ii. p. 443; Wien, 1817.

[17] Anfangsgründe der Wundarzneykunst, Vol. iii. p. 423; Göttingen, 1804.

[18] De Haen, Ratio Medendi, Pars 6ta, p. 255; Viennæ, 1763: Janin, Mémoires et Observations sur l'Œil, p. 426; Lyon, 1772: Dendy on the Cerebral Diseases of Children, p. 30; London, 1848.

[19] Janin, Op. cit. p. 428.

[20] Travers' Synopsis of the Diseases of the Eye, p. 188; London, 1820.

[21] Andral, Clinique Médicale, Tome v. pp. 682, 693, 710; Paris, 1833.

[22] Kater, Philosophical Magazine, November, 1834, p. 375; Ibid. June, 1835, p. 409.

[23] Porterfield's Treatise on the Eye, Vol. ii. p. 389; Edinburgh, 1759.

[24] Bennet's Inaugural Dissertation on the Physiology and Pathology of the Brain, p. 56; Edinburgh, 1837.

[25] Heister de Cataracta, Glaucomate, et Amaurosi, p. 331; Altorfii, 1713: Medical Works of Richard Mead, M. D. pp. 204, 536; London, 1762.

[26] Op. cit. p. 305.

[27] Lectures in the Lancet, Vol. x. p. 578; London, 1826.

[28] Vermischte chirurgische Schriften, Vol. ii. p. 3; Berlin, 1786.

[29] Op. cit.; Vol. iii. p. 443.

[30] Trattato delle principali Malattie degli Occhi, Vol. ii. pp. 227, 230; Pavia, 1816.

[31] Edwards, Lancet, 3 November, 1838, p. 227.

[32] Report of the Sixth Meeting of the British Association for the Advancement of Science; Transactions of the Sections, p. 107; London, 1837.

[33] Observations on the Cataract and Gutta Serena, pp. 407, 410, 417, &c.; London, 1812.

[34] Medical Observations and Inquiries, Vol. v. p. 1; London, 1776.

[35] Op. cit. pp. 379, 381, &c.

SECTION II.—CLASSIFICATIONS OF THE AMAUROSES.

Some will have no classification; but insist that amaurosis is always one and the same. Others have adopted the division, already noticed, into functional and organic, whereas every case of amaurosis is both. Mead divided the varieties of amaurosis into inflammatory, paralytic, and those which arise from pressure. Beer has classified the different species according to their symptoms; and it may not be improper to examine his classification somewhat minutely. The principle is evidently good; determining the seat and nature of the disease, by the particular symptoms present.

Beer admits four classes: the *first* including amaurosis, characterized only by subjective symptoms, or, in other words, by impaired vision, without any diseased appearances in the organ of vision; the *second*, amaurosis characterized, not by impaired vision only, but by changes in the texture of some part of the optic apparatus; the *third*, amaurosis characterized by impaired vision, with changes in the form and activity of some part of the optic apparatus; and the *fourth*, amaurosis in which the characteristics of the first three classes are combined.

It does not admit of denial, that we occasionally meet with cases of amaurosis, presenting such differences in the symptoms, as Beer has chosen for the groundwork of his classification. For instance, it sometimes happens that in the amaurosis from exhaustion, there is scarcely an objective symptom to be discovered, and we are obliged to admit the existence of the disease almost solely on the testimony of the patient, the case evidently falling within Beer's *first* class. The only instance which Beer has introduced into his *second* class, as characterized by loss of vision, with change in texture, is amaurosis depending on absorption of the pigmentum nigrum. Hydrocephalic amaurosis very frequently presents no other symptom than loss of sight, and fixed dilated pupil, so that it is referrible to Beer's *third* class. Amaurosis, again, from an injury to the eye, is often attended, in addition to loss of sight, by irregular immovable pupil, laceration of the tunics, and enlargement, or, on the contrary, atrophy of the eyeball. Such a case will undoubtedly belong to the *fourth* class. I trust, however, that I shall not be accused of rashness, nor of disrespect for the labours of my teacher, when I state my belief, that the cases arranged under his four classes are not uniformly attended by the symptoms which he has assigned to them; but that those species of amaurosis, which he has set down as characterized by subjective symptoms only, are sometimes attended by objective signs also, while, on the other hand, those changes in the texture and form of certain parts of the optic apparatus, which he has considered as characteristic of other species, are sometimes merely coincident, and not essential. The amaurosis, for example, which originates from over-excitement of the eye, or from plethora, which Beer places in his first class, is often attended by fixed dilated pupil, a circumstance which should assign it a place in the third class. The amaurosis from rage is merely a variety of the plethoric or apoplectic, and may or may not present the glaucomatous appearance of the humours, on account of which he has placed it in his fourth class.

Glaucoma, one of the changes upon which Beer has founded his classification, is by no means an essential part of any amaurosis. Neither is fixed dilated pupil anything more than a frequent coincidence. In the hydrocephalic amaurosis, for instance, the pupil, though generally expanded and motionless, is not always so. It must, therefore, evidently form an insuperable objection to any classification founded on symptoms, that sometimes they are, and at other times they are not present.

Beer admits as species, an epileptic, and a paralytic amaurosis; whereas the epilepsy and amaurosis in the one case, and the palsy and amaurosis in the other, ought to be regarded, not as standing in the relation of cause and effect, but merely as coincident effects arising from one and the same cause, namely, some morbid change or formation within the cranium.

While Beer's classes refer to the appearances presented in different cases, his distinctions of species are founded in general on the causes, efficient or remote, of the disease.

The following is a classification of the principal varieties of amaurosis, arranged according as the efficient causes of the disease affect, 1. The retina, 2. The orbital portion of the optic nerve, or 3. The encephalon, including the optic nerves from their origin to the foramina optica: —

I. RETINA.

I. PRESSURE ON THE RETINA.

I. Pressure on the convex surface of the retina.

1. Sub-sclerotic dropsy. (See p. 692.)
2. Inflammation and thickening of the choroid. (See p. 568.)
3. Sub-choroid dropsy. (See p. 693.)

II. Pressure on the concave surface of the retina.

1. Vitreous dropsy. (See p. 696.)
2. Displaced crystalline lens. (See p. 785.)
3. Varicosity of the retinal blood-vessels. (See p. 968.)
4. Apoplexy of the retina.

II. STRUCTURAL CHANGES IN THE RETINA.

1. Wounds of the retina. (See pp. 404. 409.)
2. Concussion and laceration of the retina. (See p. 406.)
3. Retinitis, acute and chronic. (See p. 572.)
4. Ramollissement of the retina.
5. Hypertrophy of the retina.
6. Atrophy of the retina.
7. Neuromata of the retina. (See p. 968.)
8. Melanosis of the retina. (See p. 968.)
9. Ossification of the retina. (See p. 677.)

II. ORBITAL PORTION OF THE OPTIC NERVE.

I. PRESSURE ON THE OPTIC NERVE.

I. Pressure by orbital diseases.

1. Hyperostosis or exostosis of the orbit, or of the sphenoid bone near the foramen opticum. (See pp. 40, 41.)
2. Solid and encysted tumours in the orbit. (See p. 313.)
3. Aneurism by anastomosis in the orbit. (See p. 336.)

II. Pressure more immediately affecting the optic nerve.

1. Aneurism of the arteria centralis retinæ.

2. Tumours attached to or contained within the envelopes of the optic nerve.

II. STRUCTURAL CHANGES IN THE OPTIC NERVE.

1. Wounds of the optic nerve. (See pp. 7. 17. 297. 411.)
2. Rupture of the optic nerve.
3. Inflammation of the optic nerve.
4. Hypertrophy and general or partial induration of the optic nerve.
5. Atrophy of the optic nerve.
6. Encephaloid tumour of the optic nerve. (See p. 718.)
7. Melanosis of the optic nerve. (See p. 726.)

III. ENCEPHALON, including the optic nerves from their origin to the foramina optica.

I. PRESSURE ON THE ENCEPHALON.

1. Fractured and depressed cranium.
2. Hyperostosis or thickening of the cranium.
3. Exostosis of the inner table of the cranium.
4. Fungous, osseous, and other tumours of the dura mater. (See p. 81.)
5. Congestion of the encephalic blood-vessels.
6. Apoplexy, from encephalic hæmorrhagy, &c.
7. Aneurism of the encephalic arteries.
8. Enlarged pituitary gland.

II. STRUCTURAL CHANGES IN THE ENCEPHALON.

1. Injuries of the encephalon, in wounds through the orbit (see p. 6.), in fractures of the cranium, with depression (p. 4.), in gunshot wounds (see p. 16.), &c.
2. Wounds of the optic nerve within the cranium.
3. Rupture of the chiasma by *contre-coup.*
4. Concussion and laceration of the brain.
5. Inflammation of the membranes of the brain, producing adhesions, thickening, depositions of serum, lymph, pus, &c.
6. Inflammation of the chiasma.
7. Inflammation of the brain.
8. Abscess in the brain.
9. Ramollissement of the brain.
10. Induration or scirrhus of the brain.
11. Hypertrophy of the brain.
12. Atrophy of the brain.
13. Hydrocephalus, superficial and ventricular.
14. Enlarged pineal gland.
15. Scrofulous tubercules in the brain.
16. Encysted tumours in the brain.
17. Cartilaginous, osseous, and other tumours in the brain; encephaloid cancer, melanosis, &c.

APPENDIX.

As an appendix to the above classification may be mentioned some of the complications of amaurosis; as with—

1. Puerperal convulsions.
2. Syncope.

3. Epilepsy.
4. Hysteria.
5. Disease of spinal cord.
6. Hallucinations, as in delirium tremens.
7. Mania.

Those species of amaurosis to which references are attached in the above Table have already been considered, and do not require to be brought under review. Neither is it necessary to treat formally of all the remaining species. Hypertrophy, atrophy, and ramollissement of the retina, for instance, are consequences of retinitis, the existence of which, in conjunction with amaurosis, is established by dissection; but it would be superfluous to consider these states separately, because we are at present ignorant of any diagnostic signs, by which, during life, the one can be discriminated from the other.

In many instances of amaurosis, there is reason, both from the nature of the exciting cause and from the symptoms, to conclude that the disease affects the whole nervous optic apparatus—retina, optic nerve, and portion of the brain in connection with the optic nerve. This is especially the case when the disease is of the inflammatory or congestive kind. The following may prove exciting causes of congestion or inflammation of the nervous optic apparatus; some of them operating directly or locally, others indirectly or sympathetically. When the cause is indirect or sympathetic, the transference of disease from the remote organ, such as the stomach or the uterus, is in some cases sudden and in others slow.

1. Intense light.
2. A stroke of lightning.
3. Over-exercise of the sight.
4. Irritation from teething, worms, disordered bowels, &c., as in the inflammation of the brain in children, called acute hydrocephalus.
5. Febrile diseases; as, continued fever, scarlatina, measles, &c.
6. Passions of the mind; as, rage, grief, fear, &c.
7. Insolation, or *coup de soleil.*
8. Suppressed evacuations; as, of the menses, hæmorrhoids, milk, mucus of the Schneiderian membrane, purulent matter of ulcers, &c.
9. Suppressed eruptions, acute or chronic.
10. Cold, and suppressed perspiration.
11. Narcotic and other poisons.
12. Disorders of the digestive organs, acute or chronic.
13. Albuminuria, or Bright's disease of the kidney.
14. Continued loss of the fluids of the body; as, in scorbutus, diabetes, protracted suckling, masturbation, &c.
15. Affections of the fifth nerve; as, irritation, wounds (see p. 115), and morbid changes within the cranium (see pp. 1006. 1012).

Those only who have attempted to classify the causes of amaurosis can form an estimate of the difficulties attached to the subject. Considerable difficulty arises from the fact, that the nature of many of the causes is of a mixed kind; they are structural changes, for example, of some portion of the encephalon, and yet they operate on the optic apparatus chiefly by mechanical pressure. Hydrocephalus, and the various sorts of tumours which form in the brain, are instances of such cases.

If such difficulty occurs in reasoning on the causes of amaurosis, how much more difficult the task of determining in the living subject the particular seat of organic change, and the special nature of that change! Those who will hear of no classification of the amauroses, but insist that the disease is always one and the same, deny, in fact, the possibility of recognising them by their symptoms: they regard the combinations and successions of morbid phenomena which attend amaurosis in different cases as too complicated, too variable, or too obscure, to enable the observer to establish a diagnosis. It is acknowledged that, even with the greatest care, the diagnosis is difficult: how much more so if the practitioner is careless, indifferent, or ignorant!

That so little has been achieved in the pathology of amaurosis arises chiefly from the difficulty of obtaining inspections, after death, of the bodies of those who have laboured under the disease. When such opportunities do occur, the three following remarks should be borne in mind:—

1. That it is an important question for consideration, when morbid appearances present themselves in the eye, the optic nerve, the brain, or the neighbouring structures, after death, in amaurotic cases, whether the alterations detected were *causes* or *effects* of the amaurosis. Wasting of the optic nerve, for example, may be a cause, but is often an effect.

2. No dissection of an amaurotic case can be regarded as complete, unless the brain, whole course of the optic nerve within the cranium and within the orbit, and the retina, be carefully examined, and, at least the retina, microscopically. To show the necessity of having recourse to the microscope, I may mention that melanosis of the retina consists generally in depositions so small as not to be visible to the naked eye.

3. If nothing be detected, we must not conclude that the disease has been functional merely, and not organic—a mere change in action, and not a change in the parts which perform the action. Haller's remark respecting dissections of maniacs may well be extended to those of amaurotic patients:—"Id utique adparet, plerumque in mentis vitiis encephalum pati: et si aliquando rariori exemplo non visum est pati, potuit vitium in minoribus elementis latuisse, aut incisori patientia defuisse.[1]"

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[1] Elementa Physiologiæ, Tom. v. p. 574; Lausannæ, 1763.

SECTION III.—ILLUSTRATIONS OF SOME OF THE SPECIES OF AMAUROSIS.

§ 1. *Amaurosis from apoplexy of the retina.*

Fig. Ammon, Theil I. Taf. XV. *fig.* 21.

By apoplexy of the retina is understood[1] a morbid condition of that membrane, in which its blood-vessels becoming suddenly distended, or actually ruptured, its nervous substance is thereby compressed, and its sensorial power diminished or abolished.

A suppression of the natural excretions of the body, and various other causes of determination of blood to the head and eyes, are supposed to give rise not unfrequently to affections of the vessels of the retina, and thereby to amaurosis. Chronic affections of this sort, however, are to be distinguished from those which are sudden, and the latter only are to be accounted apoplectic. The latter are likely to be promptly removed, and vision restored, by blood-letting, while the amaurosis depending on chronic distension of the retinal vessels derives no benefit from that practice.

The causes of apoplexy of the retina are generally violent, and operate either in causing a sudden flow of blood towards the head and eyes, or in impeding its return. A fatiguing journey under the scorching heat of the sun, a sudden suppression of the menstrual discharge, and the like, are apt to produce such an effect. I have known the disease arise from violent sneezing; the chief symptom being a red spectrum.

Case 875.—A lady was sent to me for consultation by Dr. Cocks, of Dundee, having had two attacks of apoplexy of the retina, from the bursting apparently of a bloodvessel of that membrane, in consequence of fits of retching while she was in the state of pregnancy.

Case 876.—Langenbeck relates the case of a miller, a robust plethoric man, who being overcome in a struggle to secure a thief whom he caught in his mill, the thief attempted to strangle him by twisting his neckcloth, and by pressing with his knuckles against the carotids. The miller's hearing and sight failed, he fell senseless to the ground, everything about him appeared black, and he was left blind. Vision returned speedily to the one eye, but the other remained for a time totally amaurotic, although ultimately it also recovered.[2]

Case 877.—A gentleman, aged upwards of 70, tall, thin, and healthy, having walked for a considerable distance, holding an umbrella against wind and rain, was thrown into a profuse perspiration. Having stopped in a shop to make some purchases, and laid his hat on the counter, he felt chilled, and got into an omnibus to return home, when he suddenly perceived a dark spectrum before his right eye, as large, apparently, as the eye itself, and covering the centre of the field of view. Even on shutting the eye, it still appeared. After some days it assumed nearly an octagonal shape, and after leeches to the temple, and repeated small blisters, it gradually cleared away.

Confusion of sight, so that suddenly the patient is deprived of the power of discerning small objects, and the appearance of a dark spectrum before the affected eye, are the most remarkable symptoms. The spectrum is not always red; sometimes it is of a greenish hue, or perfectly black. It is generally large, and of an irregular form. We might expect that numerous punctiform extravasations of blood in the retina, as Desmarres[3] found in one case on dissection, would give rise to the appearance of fixed muscæ.

The suddenness of the amaurotic attack, with flushing and turgescence of the vessels of the face, a full slow pulse, and vertigo, will generally render the diagnosis distinct. Should apoplexy of the brain occur at the same time, the diagnosis will be obscured; for blood effused in the brain may produce incurable amaurosis, although the retina is little affected.

If the vessels of the retina are merely over-distended, but not ruptured, a cessation of the cause, and the employment of blood-letting, may completely remove the amaurosis. But if a blow on the eye, strangulation, or any other cause, has produced rupture of the retinal blood-vessels, the total or partial amaurosis hence arising, being produced by blood extravasated between the retina and the vitreous body, and partly imbibed by the latter, can yield only as the blood is absorbed, which is generally accomplished very slowly.

§ 2. *Amaurosis from aneurism of the arteria centralis retinæ.*

It was an ingenious conjecture of Mr. Ware, that dilatation of the central artery of the optic nerve might sometimes be the cause of amaurosis. He had often suspected that this might be the cause, in those instances where the disease came on suddenly, and in which, though all objects placed directly before the eyes are totally invisible, there remains some small sense of light, so as to give a confused perception of objects sidewise.

The conjecture is so far confirmed by a pathological preparation, in the possession of Professor Schmiedler of Friburg, viz. an aneurism of the central artery of each retina, taken from a princess of Baden, who was long blind, and to whom Plenck, Richter, and the first surgeons of Germany, had been called. She only saw a little on looking downwards. The aneurism compressed the optic nerves.[4]

A similar case is recorded by Gräfe.[5] The patient was a female, who lost her sight under the symptoms of photophobia and feeling of pulsation in the orbit. The central artery of the retina, within the optic nerve, was distended to the diameter of a stalk of grass, and the blood-vessels of the retina were varicose.

§ 3. *Amaurosis from tumours attached to or contained within the envelopes of the optic nerve.*

Mr. Wardrop has given[6] a figure of a preparation, from Mr. Heaviside's museum, in which a tumour appears in the neurilemma of the optic nerve. No further history of the patient was known, than that he was amaurotic of the corresponding eye.

§ 4. *Amaurosis from structural changes in the optic nerves.*

That variety of amaurosis which arises from some morbid change in the substance or in the sheath of the optic nerve, is, according to Beer, developed very slowly, and rarely in both eyes. It is attended by the sensation of a black cloud, which seems gradually to become more and more dense, and by such a degree of visus defiguratus as is extremely distressing to the patient. He rarely complains of much pain, either in the eye or head, but only of a feeling of obtuse pressure in the posterior part of the orbit, although not the slightest degree of projection of the eyeball is to be observed. Even at the very commencement, the pupil is extremely enlarged, the iris completely immovable, and the pupillary edge irregular. Glaucoma takes place, followed by glaucomatous cataract, and at last, the eyeball becomes sensibly smaller than natural.

The following are some of the morbid changes extending along both the orbital and the encephalic portion of the optic nerve, which have been detected on dissection: induration of the optic nerve, unnatural adhesion between it and its sheath, the medullary substance of the nerve ash-coloured and wasted, hydatids between the nerve and its sheath, calculous concretions within the sheath. Most of these changes are, no doubt, the results of chronic inflammation, such as may arise from a great variety of causes.

As it is fully established, that destruction of the eye frequently leads to atrophy and other diseased states of the optic nerve, it is necessary always to ascertain, in our dissections, whether the case before us has been one of disorganization of the eye from inflammation, leading to atrophy of the optic nerve, or one of diseased nerve, leading to amaurosis and atrophy of the eye.

Case 888.—Mrs. ——, aged 83, had been completely blind from amaurosis for 30 years before her decease in 1817. She had also been subject to irregular gout, which assumed a variety of forms, and some months before her death she was attacked with palsy of one side.

On opening the head, aqueous effusion was found below the tunica arachnoidea, and in both ventricles. One part of the cerebrum was observed to be of a pulpy texture, but these appearances were most probably connected with the recent paralytic attack, and not at all with the amaurotic. All the nerves, with the exception of the optic, had the usual appearance. On examining the membranous sheaths of these nerves, it was ascertained that their medullary matter had been completely removed. This change had taken place even nearer to the brain than where the nerves cross each other. The arteries of the brain were in most parts altered in their structure; their coats were speckled with white spots, and their texture was more rigid and firm than natural. Both the carotids, where these vessels are in contact with the optic nerves at the foramina optica, were found to be remarkably dilated, suggesting the idea that the absorption of the nerves was connected with the enlarged state of the arteries. The absorption, however, of the optic nerves nearer the brain could not be accounted for on this notion; so that it was not easy to conjecture whether the enlarged state of the vessels was the cause or the effect of the absorption of the optic nerves. A similar tendency to enlargement was noticed where the cerebral arteries enter the cranium, and perhaps it might have been traced in other situations, if a more minute search had been made.

The twin-sister of this lady died in her 81st year, and for eight or ten years before her death had been also completely amaurotic. Though her general health was more entire than is usual at such an advanced age, she had completely lost, not only her sight, but also the sense of smell, taste, and hearing. She could not distinguish animal from vegetable food, nor one sort of fluid from another. No opportunity was obtained of inspection after her death.

Dr. Brown, who communicates these particulars to Dr. Monteath, states, that the only daughter of Mrs. —— was alive, and had been totally blind from amaurosis for several years, being then in her 56th year. Dr. Monteath adds, that he had been consulted by the son and grandson of Mrs. ——, both of whom had weak eyes. The grandson, in particular, had a very distressing degree of congenital amblyopia. Any exertion of his eyes induced temporary blindness, and though he could sometimes see a minute object, at other times he would walk directly against a table or chair.[7]

Case 889.—A gentleman, aged 78, died under my care, after having been completely amaurotic for several years. His pupils had retained their natural size, but were immovable. His lenses were glaucomatous. For several months before his death, he was occasionally troubled with spectral illusions, always of an agreeable cast. Debility, vertigo, and delirium succeeded, with headache, for which the application of leeches and blisters was used, with relief.

On dissection, the cranium was found to be very thick. There was a very copious serous effusion under the tunica arachnoidea, on the upper surface of the cerebrum. The lateral ventricles were very considerably distended with watery fluid. The thalami, on their upper surface, appeared small and elongated. There was a pretty firm adhesion between the lower surface of the anterior lobes of the cerebrum and the upper surface of the optic nerves. The substance forming the adhesion felt gritty, as if from a deposit of calculous matter. The optic nerves were flat and atrophic, especially behind the chiasma, where they seemed entirely deficient in medullary substance. In fact, they were so wasted, that they could not be traced farther than the crura cerebri. They had a watery and membranous appearance. The corpora quadrigemina seemed to be natural. The brain was of moderate consistence. The basilar, vertebral, and some of the other arteries were in a cartilaginous state.

§ 5. *Amaurosis from fractured cranium with depression, or from sanguineous extravasation in consequence of injury.*

The insensibility attending pressure on the brain from these causes may be more or less complete; for, in some instances, the patient lies unconscious, indeed, of what is passing around him, but capable of being roused by strong impressions on his senses, while, in other cases, the loss of sense is so complete, that the skin may be pinched, a lighted candle held close to the eye, and the loudest sound applied to the ear, without any evident effect.

Where the cause of these symptoms is simply a fractured and depressed portion of the cranium, they show themselves immediately after the infliction of the injury; but where they depend on extravasation of blood, either accompanying fracture or independent of it, the collection of blood may form slowly, and a considerable interval of time elapse before the patient becomes insensible.

Sir B. C. Brodie[8] observes, that "it sometimes happens, that there is a destruction of sensibility in one part of the system, while the general sensibility is impaired only in a slight degree;" and he illustrates this remark by the following instance, in which the sensibility of the optic nerves was chiefly affected.

Case 890.—An old man, who had been run over by a cart, was admitted into St. George's Hospital. There was a fracture with depression of one of the parietal bones. He was sensible, but slow in giving answers, and peevish, and it was observed that he was totally blind. Mr. Gunning removed a portion of the parietal bone with the trephine, and elevated the depression; but the operation produced no change in the symptoms. About 36 hours after the accident, the pulse became frequent, and he was delirious. He remained entirely deprived of the faculty of vision; believing that he saw imaginary objects, but totally unconscious of the existence of those actually before his eyes. At the expiration of the fifth day, he died.

On examining the body, the membranes of the brain were found inflamed, and smeared with pus and lymph. In the basis of the cranium there was a transverse fracture extending across the sphenoid, the fractured edges being displaced in such a manner as to press on the optic nerves immediately behind the orbits, and to explain, in the most satisfactory manner, the total loss of sight.

Prognosis.—Among those who recover from fractured skull with depression, or from extravasation of blood within the cranium in consequence of an injury of the head, there are some in whom the symptoms wholly subside in the course of a few days, and others in whom certain remains of one or more of the symptoms still exist after the lapse of many years. Such variety in restoration is remarkably the case with regard to the sentient power of the eye, the mobility of the pupil, and the activity of the muscles supplied by the third nerve.

Treatment.—It is unnecessary to say anything here on the surgical treatment of fractured cranium with depression. The medical means most likely to assist in restoring vision in such cases are rest, abstinence, blood-letting, laxatives, and, after a time, an alterative course of mercury. Benefit will also be derived from keeping up a continued discharge from the neighbourhood of the head.

§ 6. *Amaurosis from morbid changes in the membranes, or in the bones of the cranium.*

There are various states of the dura mater, and of the bones of the skull, capable of producing amaurosis; such as ossifications of the dura mater, especially when they are in the form of sharp spiculæ, atheromatous thickenings, fungous tumours of that membrane, and exostoses proceeding from the inner table of the skull. We have no means of positively ascertaining during life the existence of such organic changes.

The symptoms are exceedingly similar to those attendant on diseased formations in the brain. Severe cephalæa, or fixed pain in the top of the head, palsy of some of the muscles of the eye, either the abductor or the muscles stimulated by the third nerve; other of the special senses affected besides sight; weakness and stiffness in the limbs, followed by pain, spasms, and convulsions, are symptoms which lead to the suspicion of pressure on the basis of the brain, or on the pons Varolii. The symptoms increase for a time very slowly; first one eye is affected, then the other; then the organs of hearing. In many of the cases there takes place at last a protrusion of the eyes out of the orbits; a symptom indicative of great derangement in the bones forming the basis of the cranium, of the dura mater covering the sella turcica, or of the upper part of the orbits. (See *Case* 101, p. 81.)

The morbid changes of the bones, which induce amaurosis, are found chiefly in the basis of the cranium. In these cases caries is sometimes met with, but much more frequently exostosis of different forms. In some instances, innumerable spiculæ of bone project into the cavity of the cranium, so sharp that they readily wound the finger. Beer preserved the skull of a lady who had been totally blind, and for some weeks before her death insensible, in which there was scarcely any part within the cranium which was not studded with sharp exostoses. In such cases the bones are sometimes very thin, the diplöe being almost completely wanting. In an amaurotic boy, who for a short time before his death was insane, Beer found, on dissection, a spine of considerable length by the side of the sella turcica, perforating the optic nerves at their junction.

Those who have suffered from rachitis in youth, from syphilis, or from gout in middle age, are more liable than others to thickening and other morbid changes in the bones of the cranium.

Falls or blows on the head slowly bring on affections of the coverings of the brain.

In all the cases mentioned by Beer, it appears that the complaint in the head and eyes began after sudden cooling of the head, followed by rheumatism, which, though slight in its commencement, had fixed itself in the fibrous investment of the skull.

The morbid formation, which I have ventured (page 9) to call *chloroma*, and which appears to be of a fibro-plastic nature, is found to affect in some cases the pericranium; in others the dura mater, and occasionally both these membranes at once. Such appears to be the nature of a peculiar set of cases described[9] by Sir Everard Home, and attributed by him to the spread of inflammation from the dura mater to the pericranium. The cases in question were attended by the symptoms common to pressure on the brain from other causes, and amongst these by amaurosis, and were relieved by cutting down upon the cranium, so as to remove the tension of the parts covering it. In one fatal case of this kind, Sir Everard found the pericranium thickened into a mass of a fibrous bony texture; and, corresponding to this part internally, there was a similar thickening and induration of the dura mater. Most of the cases referred to had been treated by long courses of mercury without benefit, and in some of them with aggravation of the symptoms.

The prognosis in amaurosis resulting from morbid changes in the membranes or bones of the head is, I need scarcely say, extremely unfavourable. The gradual development of complete blindness, and not only death, but a very mournful death, is to be dreaded. Nor does the healing art possess any means which can be effectually employed in diminishing, much less removing, the organic changes upon which the disease depends, except, perhaps, in one or two cases. These cases are, when the symptoms evidently originate either in consequence of some accident, such as a blow, or in some evident constitutional disorder, and especially syphilis.

The following case, related by the late Mr. Wilson, of London, shows what may sometimes be done, even in circumstances which might appear almost desperate.

Case 891.—In November, 1806, Mr. Wilson was requested by a surgeon of his acquaintance to visit a gentleman, who had been affected with a long and severe illness. Mr. W. received the following account of the case.

In the spring of 1803, when influenza was very prevalent, Mr. C., a muscular man, about 28 years of age, and of rather a sanguineous temperament, was attacked with a very severe deep-seated pain in the orbit of the left eye. A physician of eminence was consulted, by whom a rigidly antiphlogistic plan was recommended. This was persevered in for a considerable time without benefit. The case was then deemed nervous, and medicines adapted for the relief of nervous diseases were employed in large quantities. The patient was ordered to remove to Hampstead for the benefit of the air. This plan not succeeding, other medical opinions were taken, and various remedies tried; but the patient gradually became worse. The sense of hearing in the left ear was now totally lost. The levator of the left upper eyelid became paralysed, and a great degree of strabismus was produced by the rectus externus having also lost its power. The pupil of the left eye became much and constantly dilated, and the sight of that eye was lost. The right angle of the mouth was permanently drawn to the right side. An extreme hoarseness took place, and his articulation became so indistinct that he could not be understood even by his friends. He lost the power of swallowing solids, and swallowed fluids with very great difficulty, as the attempt brought on a distressing sense of suffocation. A vessel was constantly placed at his side to receive the saliva, which he could neither swallow nor eject from his mouth, and which he therefore endeavoured to push out with his tongue. His bowels were most obstinately constipated, requiring the frequent use of drastic purges.

Upon visiting the patient, Mr. Wilson found his right hand and arm folded up, and, with the leg of the same side, in a state of complete paralysis. Very violent pain in the orbit of the left eye still continued, and there was also considerable pain in the vertebræ of the neck, and at the top of the shoulder. When in bed he could not raise his head from the pillow; he could scarcely sleep at all, and had no respite from excruciating pain; in short, his dissolution was hourly expected. Mr. W. learned also, that before the commencement of the disease, he had had at two or three different times, chancres and incipient buboes, and that for these he had used mercury, until the symptoms disappeared, and the surgeon who attended him pronounced his cure to be complete. In the summer preceding his illness, he had strained his back in leaping; a short time after which, a bubo formed in the right groin. This was particularly attended to, under the supposition that it might prove venereal. It suppurated and healed without mercury having been used.

Observing something particular in the figure of one of his legs, Mr. Wilson requested leave to examine it; and when the stocking was removed, perceived a cicatrice of considerable extent, and that the tibia was much enlarged. The patient did not, however, feel any pain in this bone. He expressed in writing with his left hand, that several years before, he had received a severe blow on this leg, and that a large piece of bone had come away; he could not recollect whether he took any mercury at that time, and he did not think that his surgeon considered the disease in the bone as venereal. He did not remember having had, at any time, spots on his skin or a sore throat. His present ailment, he said, had never been considered, by any of the medical persons whom he had consulted, as venereal, nor had the use of mercury ever been proposed for its cure.

On examining his neck, Mr. Wilson found several of the vertebræ much enlarged. He discovered also a large swelling in the acromion of the right scapula, and a considerable enlargement of the whole of the spine, and greater part of the superior costa, of that bone. As the muscles were wasted, a swelling was readily perceived in the os brachii, a little above the attachment of the deltoid muscle. The right clavicle possessed at least three times its usual thickness.

From the possibility of these swellings being venereal, Mr. Wilson felt justified in proposing the immediate use of mercury. The patient's relations were apprehensive that his extreme weakness, and the apparently rapid approach of death, would render the experiment useless; but willingly consented to the attempt being made, as without something being done, and that quickly, death seemed inevitable.

Accordingly, one drachm of the strong mercurial ointment, with five grains of camphor, was rubbed upon his skin every night, and a seton was inserted in the back of his neck. In four days, his mouth became affected from the mercury: in ten days he swallowed with less difficulty; he slept well, and his pains were nearly gone. In a fortnight, the enlargement of the clavicle was evidently lessened, and his muscles were much fuller and firmer. He had also recovered his speech, so far as to make himself understood. The quantity of the ointment was now increased to a drachm night and morning, and the use of it was continued for eleven weeks; towards the latter part of which time, when he could swallow with ease, he took about eight ounces of the compound decoction of sarsaparilla daily, and now and then some preparation of Peruvian bark.

During this course, although the patient's mouth was affected with a considerable degree of soreness, he gathered health and strength daily, and before it was discontinued had grown fat. His muscles had acquired very nearly their original plumpness and strength, and the limbs their former capability of motion. The pains were wholly removed, and the thickening of the bones very much reduced. His power of swallowing and of moving the right extremities, seemed at first to increase, in the same proportion as the swellings of the cervical vertebræ diminished. But though these swellings afterwards became stationary, the powers of the muscles were completely restored. His cure, with the following exceptions, was perfect, and had remained so for more than two years. The pupil of the left eye continued more dilated than that of the right, and the eyelid could not be raised quite so high as formerly; but he could distinguish objects and colours in some measure with the left eye, and even small objects when he used plain green spectacles, and employed that eye only. When he used both eyes, his vision was confused, as he then saw objects double. He still spoke with a very hoarse voice, but his articulation was sufficiently distinct.[10]

Case 892.—Dr. Abercrombie records[11] the case of a man, aged 47, whose complaints began in May, 1816, with headache, and weight in the head, aggravated by stooping, and increasing gradually, notwithstanding copious evacuations. In August his sight began to fail, with giddiness; in September, he could see objects only in a very strong light; in December, perfect blindness, the pain still continuing constant and severe; in the middle of January, stupor and forgetfulness; followed, on the 31st of that month, by coma and death.

On dissection, a tumour, the size of a large egg, was found attached to the tentorium, in such a manner, that part lay above, and part below it; the falx likewise entering into its substance above. Internally it was firm, resembling somewhat the structure of the kidney. There were four ounces of fluid in the ventricles.

Case 893.—A person, whose sex and age are not mentioned, having for a long time been deprived of the sense of smell, and latterly of that of sight, died comatose.

On dissection, a tumour, which Professor Cruveilhier considered carcinomatous, was found to arise from the dura mater where it covers the upper surface of the ethmoid bone. The tumour (*Fig*. 129.) extended backwards a little upon the sella turcica, and laterally on the roof of each orbit. It had a mammillated appearance externally, had completely destroyed the trunks of the olfactory nerves, compressed the optic nerves, and hollowed out for itself a cavity in the inferior surface of the brain. The layer of cerebral substance in contact with the tumour, was in a soft state. A vertical section of the diseased mass (*Fig*. 130.), shows the radiated disposition of fibres which it presented, similar to what is observed in other cases of carcinoma. Some vascular ramifications, apparently veins, followed the direction of the fibres. This figure also shows that the tumour had sent down some prolongations into the nasal fossæ, where it had the same mammillated appearance and the same texture.[12]

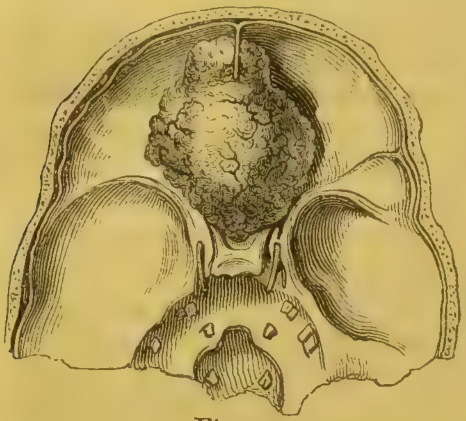

Fig. 129.

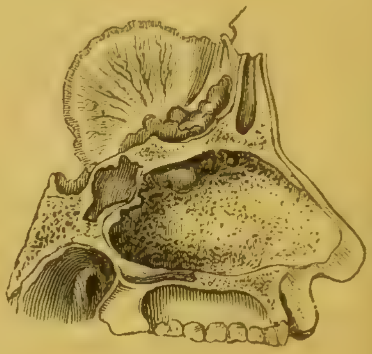

Fig. 130.

§ 7. *Amaurosis from cerebral congestion.*

It appears to be universally admitted, not only that amaurosis may occasionally result from a sanguineous overflow to the brain, or an impeded return of the blood from that organ, but that one of the most common causes of the disease is simple turgescence of the vessels supplying the internal optic apparatus.

Symptoms.—The first symptoms with which congestive amaurosis generally shows itself, are a feeling of fulness in the eyeballs, and almost uninterrupted photopsia. These symptoms are speedily followed by stupifying headache, generally accompanied by vertigo, and tinnitus aurium, and keeping pace with a striking diminution in the power of vision. In some cases, the patient is deprived of sleep; in others, he is affected with lethargy. When the internal carotids are chiefly affected, lethargy is generally a prominent symptom; when the vertebrals, pain in the occiput.[13] The patient is commonly of an athletic habit, and presents signs of general plethora. In some instances, however, the reverse of this is the case; for example, in pregnant women, who sometimes have been known to suffer towards the end of several successive pregnancies from this amaurosis. The signs of local plethora are always present. The eye appears fuller than natural; it seems to project unusually from the orbit; the patient moves it less than in health; its surface is suffused with red vessels; the face is flushed, and the temporal, and sometimes even the carotid arteries are felt strongly throbbing. The pupil, in the incipient stage, may not be much affected, being neither unnaturally dilated nor contracted, and still varying with tolerable liveliness according to the degrees of light to which the eye is exposed.

As the disease advances into the confirmed stage, the headache becomes irregular, being sometimes severe, at other times scarcely felt. The patient now complains principally of a thick gauze or network, which renders every object before him indistinct. In clear light, the network seems uniformly obscure; but in the dark, it is fiery and shining, sometimes appearing reddish, and at other times bluish. This symptom is increased by every cause which increases, even for an instant, the local plethora. For instance, if the patient presses much when at stool, the network seems thicker for some minutes after; and if this cause or similar causes of increased local congestion be frequently repeated, and the existing plethora not removed by proper remedies, vision soon becomes totally extinguished. This indeed almost constantly follows, even when there are no such occasional augmentations of the plethora, if recourse is not had to proper treatment; but not so rapidly as when such occasional causes are allowed to come into frequent operation. At last, all trace of sensibility to light is lost. The patient continues to complain of stunning headache. He complains also of a feeling as if the eyeballs were increasing in size; and they actually feel firmer to the touch than natural. The pupil becomes fixed, though rarely much dilated. The patient stares on vacancy, presenting in a striking manner the peculiar fixed look of the amaurotic.

Exciting Causes.—Every influence capable of producing or increasing a continued or frequently repeated determination of blood to the head, may be regarded as an exciting cause of this amaurosis. Those who are of a plethoric habit are generally able to produce a slight degree of it at will. When they stoop forwards, hang down the head, tie their neckcloth tight, or by any means increase the circulation of blood through the brain, or, perhaps, to speak more correctly, when they impede in any way the return of that fluid towards the heart, they excite the sensation of muscæ volitantes, or even complete temporary blindness. Boerhaave relates the case of a man who, whenever he was intoxicated, laboured under complete amaurosis. The disease came on by degrees, increasing with the quantity of wine; and after the intoxication went off, his vision returned.[14] Many plethoric persons regularly find their vision impaired during the quickened circulation from a full meal and a few glasses of wine; while those of a meagre habit not unfrequently find their vision benefited by the same causes.

The following influences may be enumerated as likely to prove remote causes of congestive amauroses; pregnancy, tedious and difficult parturition, raising and carrying heavy loads, long-continued occupations which strain the eyes while the head is bent forwards, employments requiring at once keen exercise of sight and activity of thought, rage and other violent passions of the mind, the sudden suppression of some wonted sanguineous discharge, suppressed menses, the neglect of periodic blood-letting to which the individual has been accustomed at a certain period of the year, the removal by ligature or otherwise of hæmorrhoids from which discharges of blood had become habitual, violent and long-continued vomiting, a forced march in hot weather, very hot baths even of the feet only, remaining long in an over-crowded assembly, an excessive and unaccustomed debauch, frequent constipation of the bowels, violent pressing while at stool, lying with the head uncommonly low during the night, large scrofulous or other swellings in the neck by which the jugular veins are compressed, impeded reception of the venous blood by the heart from contraction of the right auriculo-ventricular opening. If two or more of these, or similar causes, operate together, and more especially if they come to operate suddenly on an individual, perhaps constitutionally inclined to fulness about the head, then the risk of congestive amaurosis is much increased.

Proximate Cause.—Plethora is described as an excessive fulness of vessels, as a redundancy of blood, as redness of a part from distended blood-vessels, as redness, heat, and tumour even, either of the whole or of a part of the body, from the same cause; and yet as something different from inflammation. The absence of acute pain appears one of the chief distinctions of plethora from inflammation; but added to this is the fact, that though plethora often ends in the rupture of the affected vessels, it frequently terminates without any such event, while inflammation, though it is sometimes resolved, is in general attended by the effusion of serum, or of coagulable lymph, the formation of pus, ulceration, gangrene, or even by several of these events in succession.

"Plethora and sanguineous determination of the head," says Dr. Burrows,[15] "are often used synonymously in medical language; but they differ widely, inasmuch as determination may exist without plethora, and plethora without determination. Blood may be sent to the brain with a preternatural velocity, and act simply by augmented motion but be as readily returned by the veins: this is determination. It may be sent either with a natural velocity, or a degree greater or less than is natural; and from some obstructing cause be not returned by the veins in that due proportion in which it has been conveyed to the brain—accumulation, therefore, occurs: this is plethora."

The pathology of plethora of the brain, and of its frequent effect, apoplexy, is by no means satisfactorily understood; for while many observations would lead us to suppose that inflammation of the arterial tunics, and deposition of atheromatous or calcareous matter between their middle and innermost layers, are intimately connected with these diseases, if not actually their proximate causes, leading in apoplectic cases to rupture of vessels and extravasation of blood, the numerous instances, in which, after death from apoplexy, no diseased appearances whatever are detected within the cranium, show, that there not only remains room for farther investigation of the subject, but that no general conclusion can at present be adopted without danger of falling into some serious mistake. The symptoms, vulgarly supposed to be indicative of an overflow of blood to the head, or of increased vascularity of the brain, are common to very opposite states of that organ.

Prognosis. — So long as congestive amaurosis is in the incipient stage, and the power of vision not greatly impaired, the practitioner may venture to give a favourable prognosis, In the confirmed stage, or when the power of vision is nearly or completely extinguished, the prognosis is extremely unfavourable. Even when the disease is only of a few days' standing, if no power of vision be present, there can be but little hope of its recovery. When the patient has continued for several months in this state, it scarcely ever happens that even the slightest restoration of sight is effected.[16]

Treatment. — Slight incipient attacks are often cured by rest, purgatives, and a spare diet. In more threatening cases, general blood-letting ought to be practised from one of the veins of the arm, the jugular vein, or temporal artery. This may be followed up, if it seems necessary, by local blood-letting, as cupping on the back of the neck, cupping on the temples, or the application of leeches to the head. Purgatives are particularly useful. An entire abstinence from animal food must be observed, as well as from all alcoholic fluids. Cold applications are to be made to the head, which ought previously to be shaved. Complete rest of the eyes, and of the whole body, and a careful prevention of irritation from light, must be enjoined.

Depletion, then, and the antiphlogistic treatment, in all its parts, are the means upon which we are to depend, in the early period of this amaurosis. They will seldom fail us, if had recourse to within the first two or three days, and employed with the necessary vigour.

If the complaint has been neglected for some time, or treated without depletion, which we need scarcely distinguish from neglect, we should even yet have recourse to blood-letting. If depletion has been fully tried, but without benefit, the prospect is extremely bad. Excitation of the absorbent system ought now to be tried, especially by means of mercury and counter-irritation. The mouth should be made sore by a course of calomel, or blue pill; the head blistered; and an issue opened by caustic, on the nape of the neck.

Should this treatment also fail, there still remain many other remedies which might be employed; but the use of stimulants must be pursued with more than ordinary caution, as they might readily produce renewed congestion, or even induce apoplexy.

§ 8. *Amaurosis with apoplexy, from encephalic hæmorrhagy, &c.*

When cerebral plethora is neglected, it is exceedingly apt to end in that sudden abolition of the powers of sense and motion, to which we give the name of *apoplexy.* Among the usual symptoms of this state, we find loss of vision, and, most frequently, dilated pupils.

In a pathological point of view, apoplexy resolves itself into three varieties, viz. apoplexy with extravasation of blood, apoplexy with serous effusion, and apoplexy without any evident morbid appearance on dissection. The last mentioned, Dr. Abercrombie calls *simple apoplexy.* Where a person is attacked by apoplexy, and no morbid appearances are found on dissection of the brain, the cause is to be sought for in an interruption of the balance betwixt the arterial and venous system of the organ. Amaurosis may result from any of the three, and may be one of the earliest, or one of the latest, symptoms to disappear.

It is not improbable that, in many cases not suspected to be apoplectic, amaurosis is the result of the rupture of several small vessels, throwing out blood separately, and this either coalescing into one clot, or forming many small lodgments, on or in the brain; in the latter case, attended with lacerations of its substance. Slight apoplectic attacks may not attract the patient's attention, till he finds his vision seriously impaired. This is apt to be followed by palsy and loss of memory.

The suddenness of the attack, and the circumstances in which the patient is placed at the time, may lead us to conclude that the cause is of the nature of apoplexy. For instance, a man consulted me who became suddenly blind of the left eye, while attending a public meeting, brilliantly illuminated with gas, and where he had been over-heated and excited. After a time, amaurosis of the right eye followed, with partial palsy of the tongue. I saw another man, incompletely amaurotic for ten years in his right eye, who became suddenly affected with incomplete amaurosis of the left eye, after blowing a pair of Highland bagpipes for half an hour, which he found required great exertion of the lungs. I saw, in consultation with Dr. Rainy, a gentleman who, on a journey, rising in the morning, and looking out at the window of the inn, found one eye totally amaurotic, a few months after which he became hemiplegic. James Gregory, the celebrated inventor of the reflecting telescope, was suddenly struck blind, in his 37th year, while observing the satellites of Jupiter, and died a few days after.

In a case of apoplexy related[17] by Mr. Williams, coagulated blood was found to have penetrated the very substance of one of the optic nerves.

The treatment of apoplectic amaurosis does not differ in any essential particular from the plan above recommended, for the same disease, arising from cerebral congestion.

Case 894.—Mr. Stevenson was called to attend a patient between 40 and 50 years of age, who was found lying on the ground in an apoplectic fit. This person was tall and thin, his countenance pallid, and his habits remarkably temperate and regular; consequently it could not have been thought likely that he should fall a sacrifice to apoplexy. Notwithstanding the various and active means that were employed for his recovery, he expired within 12 hours after the attack.

In the forenoon of the following day, Mr. Stevenson examined the contents of the cranium, and found not only the most decisive marks of vascular congestion in the meninges, but likewise a large accumulation of discoloured serous fluid in the ventricles of the brain, and a mass of coagulated blood so situated as to compress the chiasma. This explained the cause of his total blindness, and of the fully expanded state of his pupils; although, when Mr. Stevenson first saw him, he was not entirely destitute of the power of sensation and feeling.[18]

Case 895.—Ann Nowlan, aged 43, married, was admitted into Sir Patrick Dunn's Hospital, in Dublin, said to be labouring for some days under fever, for which she had got from a physician cordial diaphoretic medicines. When she became Dr. Law's patient, she presented the following symptoms:—Distressing supra-orbital headache; pulse 100, weak; tongue loaded with a dark-brown crust at base and in the centre, red and glazed at point and edges; stomach irritable and painful on pressure; skin of natural temperature; no petechiæ; great depression of spirits. Twelve leeches were applied to the epigastrium. An effervescing draught, with tincture of opium, was given. A cold lotion was applied to the forehead.

These means did not relieve the headache, nor the sickness and irritability of stomach. On closely examining the symptoms, Dr. Law was led to regard the headache as the first and principal link in the morbid chain, and the other complaints as its effects. The patient admitted having been long subject to headache. She had a strength of voice and power of moving herself, apparently incompatible with the other symptoms, as characteristic of fever. Acting upon this view, leeches were applied to the left temple, to which she principally referred the pain. She derived temporary relief from their application. Blisters were next tried, and they also relieved for a time. Dr. Law now determined to bring the system under the influence of mercury, and ordered for this purpose a combination of calomel and James's powder. No sooner had the mouth become sore, than the headache entirely ceased, and the loaded tongue became clean. The complete exemption from pain lasted only so long as the mouth continued sore, for no sooner had the mercurial influence subsided, than the pain returned, although much less constant and less intense. When the pain returned, the tongue resumed the loaded appearance. The mercury was again resorted to, and removed the pain, never to return.

The patient now, for the first time, directed Dr. Law's attention to a failure of the sight of her left eye, of which she said she had the perfect use when she came into the hospital. The pupil was found to be permanently dilated. Dr. Law applied repeated blisters, and sprinkled some with strychnia, but the eye became quite amaurotic.

The patient had now enjoyed a long exemption from headache, and seemed to labour only under great depression of spirits, when she was suddenly seized with a fit. She was found in a state of complete insensibility; the respiration extremely laboured, but without stertor; the pulse weak and slow; face not flushed; no throbbing of the carotids. The temporal artery was opened, and about ten ounces of blood were drawn in a full stream, when the pulse began to fail. A compress and bandage were applied, but the bleeding was with difficulty restrained. The face now flushed, the carotids began to pulsate strongly, and while a turpentine enema was about to be administered, the patient expired, about two hours from the time of the seizure.

Inspection. A considerable quantity of black fluid blood issued, on dividing the scalp. The superficial vessels of the brain were very full and congested. When the brain was removed from its situation, not less than six ounces of fluid blood were found effused at its base. A large coagulum occupied the place of the locus perforatus, or floor of the third ventricle, which seemed to have been completely destroyed. Both crura cerebri were elongated and displaced, and their consistence was diminished by the violence they had sustained. The lateral ventricles were distended with two clots of blood, which lay in contact with one another in consequence of the destruction of the septum lucidum. The right thalamus was natural; the centre of the left was softened and broken down, and contained a clot. The basilar artery was healthy, but the middle arteries of the brain presented many ossified points. There was no appearance of disease in the optic nerves.[19]

Case 896.—The late Earl of Liverpool, in consequence of exposure to cold, suffered from crural phlebitis, attended by remarkable slowness of the pulse, which was 44 in a minute. The sight of his left eye became affected, and soon after he had a series of attacks of apoplexy, which proved fatal.

The left iliac vein was found completely impervious, and a large cavity filled with serum occupied the brain over the right ventricle.[20]

Case 897.—Dr. Abercrombie mentions[21] the case of a gentleman, who, after an apoplectic attack, lost his sight, and continued in a state of perfect blindness for about seven years. After that time, while one day out in his carriage, he suddenly recovered sight; and it was found that he had entirely retained his skill in drawing, for which he had been distinguished before the attack.

In this case, a clot may have pressed on the optic nerves, but becoming shrunk, had at length shifted its situation, and allowed the nerves to be freed of pressure. A fall on the head, it has been stated, has restored light to an amaurotic patient, probably from displacing a clot.[22]

§ 9. *Amaurosis from aneurism of the encephalic arteries.*

Mr. Ware was of opinion, that amaurosis might not unfrequently be owing to dilatation of the circulus arteriosus. "Should then the dilatation," says he, "take place in the posterior portion of the circulus arteriosus, so as to compress the nervi motores oculorum, the consequence will be, that the eyelids, and probably the eyes also, will lose the power of motion. But if the dilatation happens in the anterior portion of the circulus, as the compression will then be on the optic nerves, the sight must, of course, be destroyed. And should the dilatation take place in both portions, so as to occasion a compression both on the optic nerves and the nervi motores oculorum at the same time, while the eyelids will hereby be rendered immovable, the eyes also will be deprived of sight and motion together."[23]

Whether this is actually a frequent cause of amaurosis, it is impossible to say. Indeed, the want of accurate dissections is one great cause of the obscurity which hangs over the subject of amaurotic diseases. That aneurism of the cerebral arteries is occasionally a cause of amaurosis, is established by the following case, related by Mr. Spurgin.

Case 898. — A labourer, aged 57, became suddenly insensible, whilst at work, about the beginning of March, but quickly recovered without assistance, and resumed his employment. Three weeks after, he had another fit, and remained in a state of stupor three or four days. He complained of constant pain at the top of the head, much increased by stooping, and which frequently deprived him of sleep. His countenance appeared dejected, heavy, and sallow. He was extremely morose and sullen, often refusing to return any answer to questions, and frequently finding fault with his attendants. The pupils were much dilated, but both contracted slowly upon the approach of a strong light. The right eye was affected with cataract, but he could distinguish light from darkness with this eye. His pulse was generally about 90, and weak. He was purged freely, and a blister was applied to the nape of the neck. These remedies somewhat relieved him; but, after a few days, the pain became as constant and distressing as ever. He had now eight ounces of blood taken from the neck by cupping, which greatly mitigated the pain. Four days after this, while sitting at dinner, he again became comatose and insensible; his respiration hard and stertorous; his pulse full and slow. The pupil of the right eye was dilated; the left constricted; both immovable. He was now bled freely from the arm, and blistered; but became rapidly worse, and died next morning.

On dissection, it was found that the dura mater adhered more strongly to the cranium than usual, and its surface presented a blackish blue appearance from the veins beneath. Adhesions had formed between this membrane and the arachnoid, and between the latter and the pia mater. The veins of the pia mater were much enlarged, and distended with blood. Three or four fungous patches had risen from the surface of the cerebrum through the membranes, and adhered to the bone. Upon raising the falx, it was found united to both hemispheres, and these, below the falx, to each other. A considerable quantity of deeply-tinged bloody fluid escaped from the left ventricle as soon as penetrated, and a small coagulum was found entangled in the plexus choroides. In removing the upper surface of the right hemisphere, the right lateral ventricle was cut into, being raised above its ordinary level, and a quantity of coagulated blood was discovered, amounting to three or four ounces. The right corpus striatum had become enlarged to more than twice its natural size. The surface of this body, and the sides of the ventricle, were abraded and pulpy, leaving a pinkish green appearance. Removing the brain from the cranium, a long red streak was seen upon the under surface of the right anterior lobe, and under this an abscess was discovered, of rather more than an inch in length. Immediately behind this, to the other side of the olfactory nerve, and before the junction of the optic nerves, an aneurism, of the size of a hazel nut, of the right anterior cerebral artery, was found pressing upon the right optic nerve. The coats of the aneurism were very thick, and its cavity contained a small coagulum. It had burst on its upper surface into the lateral ventricle.

The sheath of the right optic nerve, particularly at the entrance of the nerve into the eye, was found thickened and distended with blood, and adhered firmly to the proper substance of the nerve. The veins were much enlarged on the back of the sclerotic. The choroid had its usual appearance; but the retina presented a pinkish-grey colour, and the ramifications of the central vein could be readily seen over its whole surface, as far as the lens. The posterior capsule of the lens was opaque; the lens semi-opaque, and wasted to one-half its natural size.[24]

§ 10. *Amaurosis from enlargement of the pituitary gland.*

Lying beneath and behind the chiasma of the optic nerves, the pituitary gland, in a state of morbid enlargement, necessarily comes to press upon the nerves, and has sometimes been found to have produced almost their complete absorption. In some cases a tumour is developed between the two laminæ of the dura mater which inclose the gland, the gland and the optic nerves being displaced by the tumour.[25]

Numerous cases of amaurosis from enlarged pituitary gland are on record. In some of them, the affection of sight was one of the earliest symptoms; while, in others, it did not occur till a variety of other signs of encephalic disease had manifested themselves. Along with the amaurosis, which generally affects both eyes, and after being incomplete for some time suddenly becomes complete, the patient complains of pain or weight in the forehead, and severe pain in the temples, apathy, loss of memory, emaciation, and general weakness. Neither convulsions, nor hemiplegia, seems liable to occur from enlargement of the pituitary gland, but the parts in contact with the diseased mass are excited by its presence to inflammation, so that at last the symptoms present a combination of those of encephalitis with those of pressure on the brain.

On dissection, the gland is found much enlarged, sometimes dilated into the form of a cyst, or containing pus, and the parts around it much inflamed. In some cases, the infundibulum is the seat of the enlargement, as in a case recorded by De Haen.[26]

Case 899. — John Austin, a baker, a strong muscular man, of temperate habits, aged 38, had for three years been afflicted with dimness of sight, accompanied at intervals with severe pain in the fore part of the head, and a sense of burning and fulness of the orbits. He received no benefit from leeches, blisters, and other remedies; on the contrary, the application of leeches appeared rather to increase his sufferings. His strength and general health continued very good, he was up during the greater part of the night, and frequently carried very heavy loads during the day. The digestive organs had been, for the most part, regular in their functions, excepting at slight intervals, and then only from such causes as might be considered wholly independent of any existing local affection.

On Sunday, 25th May, 1823, he complained that, during the preceding five or six weeks, the dimness of vision had considerably increased; that the pains had been much more severe, and that he had felt a strong inclination to sleep, so much so, that if, during the day, he sat down for a few minutes to refresh himself, he fell asleep, being unable to prevent it, and would continue so until disturbed. For two or three days, he had been completely blind in the right eye, and that morning found himself, for the first time, totally blind in both. For a week or ten days he had been able to distinguish objects, but upon going to bed the previous evening, the only object he could discern was the candle, and that not distinctly.

On examining the eyes, no very apparent disease manifested itself, the pupils did not contract on the application of a strong light, they appeared rather small, but perfectly clear. The patient complained of some loss of appetite. Pulse 96, and small. On the supposition that some of the more prominent symptoms depended on a disordered state of the stomach, he was ordered an emetic, and after its operation five grains of calomel, to be followed next morning by an opening draught.

Next day, his headache was not so considerable, and in a small degree he had recovered sight in the left eye; he could see the windows, and on placing the hand before his eye, he could distinguish something, although unable to tell what it was. The medicines were repeated.

On the 27th, he complained of being much weaker, and consequently kept his bed, which he had not done previously. His headache was better; his vision as on the 26th; he slept constantly, and snored loudly. Six leeches were ordered to the temples, the calomel and opening medicine were continued, and a blister was applied to the nape of the neck.

On the 28th, an eminent oculist being called in, he considered the illness to arise from congestion in the cerebral vessels, and ordered 20 ounces of blood to be taken from the arm, with a saline draught every four hours. The patient fainted when he was bled.

On the 29th, he was more inclined to sleep; was roused with difficulty, but when awake, spoke sensibly, and answered questions proposed to him. Since the bleeding, the pulse had been 120, and weaker; and the patient's debility greater. A physician who was called in, ordered him to lose 24 ounces of blood from the arm, the saline medicine to be continued, 4 grains of calomel to be taken at bed-time, and an opening draught on the following morning. Next day, at half-past twelve, the patient died.

On dissection, the membranes of the brain were found quite healthy; some degree of fulness of the vessels existed, but it was only trifling, the fluid in the ventricles was about the natural quantity; on raising the anterior lobes of the brain, a tumour was found arising from the situation of the pituitary gland, and pressing upon the optic nerves; it was of considerable size, forming a nidus in the anterior lobes; the optic nerves were expanded upon it, the right more than the left; the olfactory nerves were likewise very much pressed upon.[27]

Case 900.—A person of the name of Bardon, aged 36, was admitted into the *Hôtel-Dieu* at Paris, on the 8th September, 1827. His pupils were greatly dilated, the right being still slightly moveable, the left not at all. The left eye, was, in fact, completely lost; the right just served for discerning large objects, without enabling the patient to distinguish their size, form, or colour. For eight years he had been subject to violent pains in the head, and a year and a half before his admission into the *Hôtel-Dieu* had been obliged to give up his occupation, which required him to be frequently employed in writing. His countenance was pale, and constitution lymphatic. He was bled, and had a seton inserted in the neck, without much benefit. Blisters were next applied to the forehead and temples, followed by sensible amendment, so that in three weeks he could distinctly perceive persons passing at a considerable distance. The same means were continued, and the patient remained in the same state till the 13th of November. Upon that day, he complained of headache, and severe pains in the eyes and ears. On the 15th, fifteen leeches were applied behind the ears; the headache subsided, but the other pains continued. On the 21st, two or three minutes after speaking to one of his medical attendants, he suddenly expired.

In the interval between the junction of the optic nerves and the pons Varolii, and between the vessels forming the circle of Willis, there was a cyst, the size of a small hen's-egg, partly fibrous, partly osseous, filled with a yellowish substance, mixed with blood, about a third of this substance being solid and somewhat resembling a tubercle, the rest fluid and oleaginous. This cyst had flattened and almost destroyed the optic nerves. Indeed, what remained of these nerves adhered along its inner side to the cyst, by some altered cerebral substance, and anteriorly lost itself upon the osseous part corresponding to the commissure of the nerves. Farther forwards, the nerves were found in a wasted state passing into the orbits; but between this, their anterior portion, and the posterior, there was no other continuity than what was formed by the cyst. There was no trace of the pituitary gland, its situation being entirely occupied by the cyst. The retina within the eye was thin, reddish, and almost transparent.[28]

This case is published by Magendie, with the following query prefixed to it, *Can vision be preserved notwithstanding the destruction of the optic nerves?* It is probable, that the patient had either deceived himself, regarding the degree of vision which he recovered after the application of the blisters; or, that if he was actually able to perceive persons passing, as is stated in the case, eight days before his death, the progress of the disease during that period had been exceedingly rapid.

§ 11. *Amaurosis from concussion, or other injury of the head.*

Injuries of the head, many of these appearing to be slight and occasioning at first no apprehension, are probably much more frequently productive of amaurosis than is generally suspected.

It not unfrequently happens, in cases of concussion of the brain, or other injury of the head, sufficient to stun the patient, that for a time he remains completely insensible to external impressions. The recovery, which, in general, speedily takes place, is sometimes complete; while, in other cases, the state of total insensibility is followed by one in which the sensibility is impaired, but not destroyed. The patient is not affected by ordinary impressions, but can be roused to perception. The pupils, in this stage, contract on exposure to light, and are sometimes more contracted than under ordinary circumstances. These symptoms may wholly subside in the course of a few hours, or they may continue for three or four days. In the latter case, it frequently occurs, that the patient regains his sensibility for a time, and then relapses into his former condition. Where inflammation of the brain follows concussion, it sometimes happens that there is no interval of returning sense, the symptoms of concussion being gradually converted into those of inflammation. But it is also often the case, that there is a considerable interval of that sort, or even a period of apparent health, before the symptoms of inflammation show themselves. Years may elapse before the patient becomes affected with any serious indications of cerebral disease.

The inflammation which succeeds to concussion, and other injuries of the head, may be more or less extensive, and more or less acute; affecting the whole contents of the cranium, and rapidly proving fatal, or limited to some particular part of the brain, and inducing death only after a series of the most distressing symptoms, as violent headache, amaurosis, palsy, convulsions, and the like. These symptoms occur sometimes in one order, and sometimes in another. Our knowledge of diseases of the brain is not yet sufficiently exact, to enable us to refer the symptoms which occur, to the particular seats or terminations of the inflammatory action.

The appearances on dissection consist in lacerations of the summits of the cerebral convolutions, increased vascularity, extravasations of blood, serous effusions, indurations, softening or ramollissement, diffuse or encysted abscesses, &c.

Case 901.—A young gentleman, at 12 years of age, received a rap at school with the edge of a flat ruler, because he was dull at his learning. The blow was on the right side of the head, and a small wound was the consequence, which, for the space of six years, nothing would heal. It then healed, and he very soon afterwards perceived that his sight was beginning to fail. In this respect, he continued to decline, till, at length, he became quite blind. Added to this, he now began to suffer from epileptic fits, which most frequently returned upon him every day.

The only thing considered likely to afford any prospect of real advantage, was the removal of a portion of bone by the trephine. There was no particular appearance in the cicatrice of the old wound, where the blow had been received; nor, on exposing the bone, was it found diseased, or even discoloured. On removing the piece separated by the crown of the trephine, some blood and serous fluid escaped from between the skull and dura mater. This membrane, however, did not appear to have lost its healthy colour. By the next day, the pupil of each eye had recovered its natural sensibility, dilating and contracting, according to the degree of light. The blindness remained absolute, as before the operation. The patient's strength hourly declined; a degree of low fever supervened; and on the third day after the application of the trephine, he was seized with an unusually severe fit, soon after which he expired.

On opening the head, the cranium was to appearance everywhere healthy, and so was the dura mater. Below the part where the dura mater had been exposed by the trephine, and consequently opposite the seat of the original wound, the pia mater had evidently suffered from chronic inflammation, but this appearance was circumscribed. On cutting into the brain, it was found indurated to a considerable degree, and this induration had extended itself to the whole of the middle lobe of the cerebrum, commencing upon the surface of the hemisphere, and passing through the brain down to the basis of the cranium.[29]

Case 902. — A young lady, when about 15 years of age, received at play a slight tap, rather than a blow, on the right side of her head. It gave her at the moment rather severe pain; but she disregarded it, and no immediate consequences of any kind followed, more than a common headache, commencing always in the part which had been struck. For above 30 years she continued subject to these attacks, and then, though naturally very lively, began to grow heavy, and sometimes stupid and sleepy, without any known additional cause. This disposition continued gradually to increase, till, for the last year and a half of her life, it was very difficult to keep her awake; but when she was awake, though it was but for half an hour, she displayed all her natural brilliancy of conversation. Then, all at once, she would drop asleep again, not to be roused. In this way she went on till a perpetual comatose state took place, and she died convulsed. Her vision had become very much, although very gradually, impaired.

On dissection, as soon as the scalp was removed from over the right parietal bone, a portion of the bone, about the size of a crown pieee, directly under the part where the blow had been received, and to which she had invariably pointed as the seat of her pain, was observed to be of a very dark colour. On removing the right parietal bone, the part of it which appeared discoloured, was found to be transparent, and almost wholly absorbed. It derived the dark colour, which it at first presented, from the portion of the right hemisphere of the brain, directly under it, being perfectly black; the dura mater at this part being altogether removed by absorption, the colour appeared through the bone. Had she lived much longer, the bone also would have been quite absorbed, and the brain itself would, in all probability, have protruded. The portion of brain under the seat of the injury was indurated and scirrhous, and this change had taken place through the whole of the middle lobe of the cerebrum. The colour was dark livid. Every other part of the brain was perfectly sound, nor was there any disease in the thorax or abdomen. The disease above described, had so pressed on the optic nerves at their origin, as to make them as flat as a piece of tape, thereby occasioning the loss of sight, which, for some time before death, had amounted to almost total darkness.[30]

§ 12. *Amaurosis from congestion or inflammation of the nervous optic apparatus, brought on by exposure of the eyes to intense light, or by over-exercise of the sight.*

This is one of the most frequent varieties of amaurosis, resulting sometimes from a single, short, or even momentary, exposure to very vivid light; in other cases, from long-continued, or frequently-repeated, examination of luminous objects, or from intense exercise of the sight upon things moderately or imperfectly illuminated. Persons, for example, have been struck blind from viewing an eclipse of the sun. Long-continued exposure of the eyes to the light reflected from a country covered with snow, the frequent use of telescopes or microscopes, reading or writing for many hours together, especially by candle-light; these, and such-like are the fruitful causes of this variety of amaurosis, and are more apt to produce their injurious effects on the organs of vision, if the eyes are naturallly weak, or the individual inclined to cerebral congestion. Literary men, engravers, and others, whose occupation is at once sedentary, and requires constant exercise of the sight, are frequently affected with this amaurosis.

The symptoms are variable, but chiefly subjective. The congestion or inflammation, upon which they depend, affects the retina, the optic nerves, and the cerebral portion of the optic apparatus. Neglected, it ends in atrophy of these parts.

The treatment consists principally in rest, depletion, mercury, and counter-irritation.

Case 903.—Consulted 1st July, 1844, in the case of Miss F., aged 16., I found that, after working at Berlin worsted work, she had become affected with pain in the left side of the head, and such dimness of sight of the left eye, that with it she made out with difficulty the large letters forming the heading of a newspaper. The right eye was also rather dim. I applied leeches round the eye, blistered behind the ear, and gave three blue pills daily. This not affecting the mouth so speedily as I expected, I changed the blue pills for pills of two grains of calomel with half a grain of opium. These soon affected the mouth, and vision immediately began to improve. The mouth became very sore, with profuse salivation. By the end of July, the patient read the smallest type with the left eye.

Case 904. — The celebrated Dr. Reid, Professor of Moral Philosophy in the University of Glasgow, in May, 1761, being occupied in making an exact meridian, in order to observe the transit of Venus, rashly directed to the sun, by his right eye, the cross hairs of a small telescope. He had often done the like in his younger days with impunity, but suffered from it on this occasion. He soon observed a remarkable dimness in that eye; and for many weeks, when he was in the dark, or shut his eyes, there appeared before the right eye a lucid spot, which trembled like the image of the sun seen by reflection from water. This appearance grew fainter, and less frequent by degrees, but some very sensible effects of the injury remained. The sight continued dim; the nearest limit of distinct vision was rendered more remote than in the other eye; and a straight line appeared to the right eye to have a curvature in it.[31]

Case 905. — A soldier, unacquainted with the proper method of observing an eclipse of the sun, employed for that purpose a piece of opaque glass, with a transparent point in its centre. Notwithstanding the vivid and painful impression he experienced from the solar rays which passed through the lucid part of the glass, he continued to look at the sun, till the end of the eclipse. He was soon afterwards seized with vertigo, and pain on the right side of his head, corresponding to the eye which he had employed, and found himself almost entirely deprived of the sight of that eye. Some few weeks afterwards, finding that the acute pain of his head still continued, he came under the care of Baron Larrey, who observed that the vessels of the eye were injected with blood; the pupil a little less than that of the opposite eye, preserving, however, its natural movements; vision very obscure, or almost lost. After two blood-lettings, one from the temporal artery, and the other from the jugular vein, Larrey ordered blisters to the temple, and to the nape of the neck. Ice was then applied to the head, followed by moxas, which completely re-established the patient's sight; but he still retained a feeling of dull pain over all the right side of the head.[32]

Case 906.—A West Indian, of middle age, who lived freely, and was accustomed to an indolent life, after having been for four hours on horseback, exposed to a burning sun, began almost immediately to notice a dimness of sight in his right eye, which rapidly increased, so that at the end of a fortnight his sight was entirely lost. There was never any pain or inflammation in the part. Eighteen months after the commencement of the malady, the eye, though perfectly blind, presented no appearance of disease, except that the pupil contracted imperfectly on exposure to light.[33]

Case 907.—A captain in the navy had made much use of his right eye, for many years, in observations with telescopes and sextants. About a week before he applied to Mr. Travers, he observed a mist before this eye, which increased until it was so dense, that he could neither distinguish the features of his friends, nor the large letters of a title page. The eye was free from inflammation, the pupil large and sluggish; he had no pain either in the eye or the head. He was bled copiously from the arm and temple, and briskly purged with calomel and jalap, at short intervals. Blisters were applied to the temples. He then rubbed in a drachm of the strong mercurial ointment for several nights in succession; this produced a copious flow of saliva and violent diarrhœa, so that no benefit was obtained. By a calomel and opium pill taken night and morning, his gums were immediately made sore In three days, the mist began to clear, and he was delighted to find that he could tell the hour by his watch. He continued improving so rapidly, that at the expiration of ten days, he could read an ordinary print with perfect facility, and the pupil had recovered its ordinary magnitude and activity.[34]

Case 908.—Mr. Allan mentions the case of a master of a printing-office, who became blind. He had corrected the press, and was otherwise engaged in reading, for 18 hours out of the 24, a practice which he continued for 12 months, notwithstanding an evident failure of his sight. At the end of this time, the amaurosis was so complete, that he could not distinguish one object from another, but was merely capable of perceiving the light, so as to find his way in the streets. He continued in this state for several years, but ultimately recovered sight. The treatment is not mentioned.[35]

§ 13. *Amaurosis from congestion or inflammation of the nervous optic apparatus excited by the presence of worms in the intestines.*

Among the symptoms generally enumerated as indicative of the presence of worms in the bowels, are dilatation of the pupil, want of lustre in the eye, blueness under the lower eyelid, epiphora, paleness of the countenance, headache, throbbing in the ears, and disturbed sleep; while, in certain cases, we are told that amaurosis, deafness, and apoplectic or epileptic fits, arise from the same cause. The presence, however, even of the majority of these signs cannot be regarded as conclusive evidence of the existence of worms; nor any signs, except the actual detection of the worms in the alvine excretions, or in the matter vomited by the patient. It must also always admit of doubt, whether the amaurotic symptoms present in those who are troubled with worms, do not spring from some other cause, as hydrocephalus or some morbid formation within the cranium. One of my medical friends informs me, that he some time ago treated a child, who was amaurotic, and who at the same time passed numerous lumbrici, to which he was led to attribute the affection of the eyes. The amaurosis, however, did not yield to anthelmintic remedies; the child died, and on dissection the pituitary gland was found dilated into a tumour, which pressed upon the optic nerves, and had caused the absorption of their medullary substance.

That amaurosis from worms is not a frequent disease, may be concluded from the fact, that Bremser[36] merely quotes from Hannæus, that a little girl of four years of age, who had lost the powers of seeing and of speaking, was cured by the use of vermifuges; and from Remer, that two persons, affected with amaurosis, were cured by the evacuation of ascarides. Rognetta[37] quotes from Weller, the case of a little girl, aged six, who had been for three years completely amaurotic. Every other means having failed, anthelmintic powders were given, in consequence of which the child passed thirteen lumbrici in six days. By the continued use of purgatives, vision was in a great measure restored. In a case recorded by Pétrequin[38], a cure was effected chiefly by the employment of the seeds of the santonicum, or artemisia judaica.

Case 909.—I have seen only one instance of amaurosis caused by worms. It occurred in a girl seven years of age, a patient at the Glasgow Eye Infirmary. After an attack of inflammation of the eyes, attended by headache, her vision was left dim, when suddenly her pupils became widely dilated and immoveable. The abdomen was much swollen. About a month previously to this she had passed a lumbricus. A mixture of castor oil and oil of turpentine being given in doses of half an ounce every third morning, she passed at different times nine lumbrici, and vomited two, after which the belly became soft, the pupils contracted when the eyes were exposed to the light, and in the course of a few months' treatment vision was restored.

Case 910.—Delarue relates the case of a young country lad, who being brought to the Hôtel-Dieu at Clermont-Farrand, was found to be blind, his pupils much dialated, the expression of his countenance wild, his face swollen and injected; and his mind affected by times with fits of excitement. He was reported to have been bit by a mad dog, and was placed in a room on the ground-floor appropriated to hydrophobic patients. He refused to take drink or food of any kind, and died the first night after entering the hospital. On dissection, the intestines were found to contain above 160 lumbrici.[39]

§ 14. *Amaurosis from congestion or inflammation of the nervous optic apparatus, consequent to suppression of the menses.*

When amaurosis occurs as a disease of conversion, or as a consequence of the suppression of any wonted evacuation, it is often difficult to say, whether the disease of the brain, to which the affection of the optic apparatus is to be attributed, is congestive, inflammatory, or hydrocephalic. In a practical point of view, this difficulty is not very important, as the relief of the brain, by blood-letting and purging, and the recall of the suppressed evacuation or original disease, would still remain the chief indications, whatever was the nature of the cerebral affection.

Case 911.—The following case is related by Mr. Brown of Musselburgh. The patient was a female about 40 years of age. Upon walking a considerable distance, in very warm weather, the catamenia appeared, nearly upon the termination of her walk. Being very much heated, she drank a full draught of cold skim-milk, which almost instantly brought on oppression about the præcordia, headache, and a total cessation of the menstrual discharge. In a few hours more, the headache became excruciating, and symptoms of hemiplegia presented themselves, with an attack of amaurosis in the left eye.

By means of a copious local and general bleeding, blisters, and purging, considerable relief was obtained; but the affection of the eye remained the same. When the period of menstruation returned, no discharge occurred. Being of opinion that no complete cure could be effected, unless the recurrence of the catamenia could be obtained, Mr. Brown directed his attention chiefly to this object. At the end of six months, they re-appeared, which was followed soon after by the complete restoration of sight.[40]

Case 912.—A lady, aged 30, about the 5th June 1824, was exposed to cold and fatigue during the flow of the menses, which ceased prematurely. After this, she was for some days observed to be remarkably languid, dull, and depressed. The pulse was natural; she complained of slight headache; but her appearance had excited an apprehension rather of aberration of mind than of any bodily complaint; and in this manner the affection went on for nine or ten days. Dr. Abercrombie saw her on the 15th; she was then odd in her manner, abrupt and absent, but quite sensible when spoken to; she complained of slight headache; pulse a little frequent. On the 16th, she was much oppressed; and on the 17th, in a state of nearly perfect coma, which continued on the 18th. On the 19th, after free purging with croton oil, she came out of the coma entirely, was quite sensible to every thing, and no alarming symptom remained, except that she sometimes saw objects remarkably distorted, and sometimes double. At other times, her vision was quite natural; the pulse was frequent, and the tongue loaded. In this state she continued for several days; she then complained again of headache; there was occasional incoherence; the sight was more indistinct, with dilated pupil; and the pulse increased in frequency. The pulse continued to rise, with much incoherent talking, and sinking of strength; and she died on the 20th, without coma.

The ventricles were distended with fluid, and there was extensive ramollissement of the septum and fornix. There was no other morbid appearance.[41]

Case 913.—A young woman, who had been for a length of time affected with amenorrhœa, and had suffered repeated and sudden attacks of congestion in different organs, had notwithstanding felt herself pretty well for some time, when one morning she awoke blind. At first it was supposed she was jesting, but the reality of the case soon became manifest. Leeches were applied behind the ears, pediluvia were used, and laxatives given; and by the twelfth day some amelioration had taken place. M. Desmarres, on being now called in, found the pupils completely motionless and considerably dilated, and the perception of light absolutely extinguished. The patient continued blind, notwithstanding the use of many energetic remedies.[42]

Along with amaurosis from a suppression of the menses, arising from disease, may be mentioned the loss of vision which sometimes occurs from pregnancy.

Case 914. — Beer saw a young Jewess who, in her first three pregnancies, which followed closely on each other, even from the first began to grow blind, in the third or fourth month became completely amaurotic, and the first two times remained so till she was confined, but did not recover her sight after the third.[43]

§ 15. *Amaurosis from congestion or inflammation of the nervous optic apparatus, consequent to suppressed purulent discharge.*

Case 915.—A waggoner, aged 45 years, undertook a journey in wet and cold weather. The discharge from ulcers of his legs, which had for many years continued open, was suppressed, and he became blind. Fourteen days after, he was brought to the hospital. He saw nothing, not even a brightly lighted window. The pupil was oblong and extremely dilated. Beer immediately pronounced the most favourable prognosis, especially as there were present internal sensations of light in the eye, without varicosity, and without change in the humours. He had cured more than 20 such amaurotic patients, by restoring the purulent discharge. The prescriptions were sinapisms, of the size of the hand, to the ulcers of both legs, pediluvia with mustard, and internally three of the following powders daily—℞ *Sulphuris aurati antimonii gr. i. Camphoræ gr. ii. Florum sulphuris gr. vi. Sacchari gr. x. Misce.* The sinapisms were renewed daily, and on the 10th day vision began to return. The sinapisms acted severely on the ulcers, which became deep cavities, with dark-coloured edges. In 30 days, vision was almost completely restored.[44]

§ 16. *Amaurosis from congestion or inflammation of the nervous optic apparatus, consequent to suppressed perspiration.*

Cases are related by various authors, in which amaurosis appeared to arise from exposure to cold, or sudden suppression of perspiration. Thus, Arrachart mentions the case of a young woman, who during the excessive heat of summer, having carried a load of clothes to the river, and arriving in a state of profuse perspiration, plunged her hands into the water. The cold seized her, her skin became instantly dry, and in less than a quarter of an hour she was deprived of sight.

He relates also the case of a very corpulent young man who, having remained for a long time in a room strongly heated by a stove, had the imprudence to go out while completely perspiring. The cold air suddenly suppressed the perspiration. He went to bed with violent headache, and next morning awoke blind. In both cases, the pupils remained black, dilated, and immoveable, the eyes fixed and stupid, and the body oppressed and actionless.[45]

I was consulted by a gentleman who, in consequence of having taken a shower-bath, a thing to which he was quite unaccustomed, while heated, became affected with headache and incomplete amaurosis.

Treatment.—The general treatment consists in depletion by blood-letting and purging, followed by the use of diaphoretics and alteratives. Calomel with opium, Dover's powder, guaiac, camphor, and sarsaparilla, prove essentially serviceable.

Amongst external applications, vesicatories hold the chief place. They are to be applied alternately behind the ear, on the temple and on the forehead, so that a continued succession of them may be kept up.

Case 916.—An intemperate liver, much exposed to cold weather in his occupation of driving a waggon with fish into London during the night, first became affected with a severe pain in his forehead, and lost the sight of one eye. Continuance in his old habits soon brought the other eye into the same state. He continued to suffer from violent pain and tension over the forehead, for which, being admitted into University College Hospital, under the care of Mr. Liston, he was bled and blistered with advantage. He was subject to fits, and eventually perished from fever. On examining the brain the cause of the amaurosis was at once apparent; the anterior lobes of the cerebrum were coated over with lymph, which glued the dura mater to the brain, enveloping and compressing the optic nerves.[46]

Case 917.—J. Powell, a very healthy old man, 77 years of age, had been for many years subject to an excessive perspiration from the feet, more especially upon taking any exercise. This tendency had for several years been so great an inconvenience, as to oblige him sometimes to change his stockings several times in the course of the day. He was one day advised by a neighbour to apply the fresh leaves of dock to his feet, and was assured that this would effectually cure his complaint. Accordingly he laid a single dock leaf to the sole of each foot, and very soon perceived that they had taken effect. He felt a sensation of tingling and irritation whenever the leaves came in contact with the skin. Within half an hour after they were applied, he experienced great uneasiness and pain in the head. This pain soon became very distressing, particularly over his eyes, which it is remarkable were so quickly affected, that before the leaves had been applied an hour, he was nearly totally blind.

On being admitted into St. George's Infirmary, it appeared that he could perceive a strong light, and could make out the figure of an opaque object, placed between him and a clear light. Such objects appeared involved in a thick mist. During the following night, the pain in the head totally deprived him of sleep; but he had no constitutional disturbance, or disposition to fever. Next day, he was much the same. There was no action of the iris of either eye, on exposure to various degrees of light. The pupils remained fixed, in a state of permanent contraction. He was, however, still able to perceive when he was brought near a window; but this was all he could make out.

A blister was applied behind each ear, and others to the lateral parts of the feet. Small doses of calomel were ordered at short intervals, with a view to bring his system under the mercurial influence. As soon as the blisters began to operate and become painful, he perceived the pain in the head and affection of sight relieved. By the time they were dressed, at the usual period of 24 hours after their application, he was able to distinguish many objects with tolerable precision, which were before totally invisible. Dressings of an irritating kind were applied, as it was deemed necessary to keep up a considerable discharge for some time. It was also directed, that his feet should be immersed in warm water, morning and evening, and afterwards wrapped very warmly in flannels, to restore, if possible, the wonted freeness of perspiration.

Under this treatment, the patient was gradually restored to health, losing the distressing pain in his head, while he every day found his sight improve. The mercurial course affected his mouth rather smartly, and under its influence he had the comfort to find himself entirely relieved of the little remaining headache, and very nearly the whole of the affection of his eyes. He had previously enjoyed a clearness of sight very rare at his age, and after his recovery, his vision became nearly, though not quite as good as it had been before the suppression of the perspiration from his feet. On leaving the infirmary, he was recommended to wear a piece of oiled silk, wrapped round each foot, with a view to encourage the insensible perspiration.[47]

§ 17. *Amaurosis from congestion of the nervous optic apparatus, produced by poisons.*

Almost all substances included under the classes of narcotic and narcotico-acrid poisons, along with other effects on the nervous system, produce, when taken in certain quantities, dimness of sight and dilated pupils. Dilatation and fixedness of the pupils follow the application of some of these substances even to the skin merely, and of this we take advantage in the treatment of several of the diseases of the eye; but it does not appear, that, employed in this way, belladonna and hyosciamus produce any other effect upon the function of vision, than a degree of obscurity and dazzling, such as the mere influx of light through a much dilated pupil might produce. Taken internally, however, these poisons, as well as many of their congeners, cause complete insensibility of the retina, accompanied by dilatation of the pupils in most instances, but sometimes by contraction. They also cause flushing of the face, delirium, spectral illusions, coma, convulsions, and, if not speedily counteracted, death.

The effects of large doses of belladonna have been frequently witnessed, in consequence of children and adults being tempted, by their fine colour and bright lustre, to eat the berries of that plant. Dryness of the throat is an almost uniform symptom in such cases, and, along with difficulty in swallowing, is much complained of by the patient. The delirium is generally extravagant, and accompanied with immoderate and incontrollable laughter, sometimes with constant talking but occasionally with complete loss of voice. The eyeballs are red and prominent. Vision is more or less affected; sometimes so much so that even the brightest light cannot be distinguished. The torpor or lethargy which follows the delirium, occurs more or less quickly, but in general not for several hours after the poison is taken. Convulsions rarely appear to be produced by belladonna. The effects of this poison are by no means so quickly dissipated as those of opium. The blindness, especially, is often a very obstinate symptom, sometimes remaining long after the affection of the mind has disappeared. For days, and even weeks, the pupils continue dilated, and vision disordered.[48]

Similar effects are produced by large doses of hyosciamus or stramonium.[49] Blindness, with dilated pupils, also attends poisoning by dulcamara, white hellebore, tobacco, and several other substances.[50] Opium and alcohol[51] also induce insensibility of the retina, accompanied at first with contraction, but on the approach of death, with dilatation of the pupils.

It becomes a question of great importance, How do the narcotic and narcotico-acrid poisons act in the production of amaurosis? Do they operate, through the medium of the nervous system, on that part of the brain which forms the immediate organ of visual perception, on the optic nerve, the motor oculi which animates the iris, and the other nerves connected with the eyeball and eyelids? Or do they merely induce congestion of the vessels of the brain, and sometimes extravasation of blood within the head? They probably act in both these ways. Congestion of the cerebral vessels is commonly, though perhaps not invaribly, found on dissection, after death from a narcotic or narcotico-acrid poison, and must undoubtedly tend to produce insensibility in cases of poisoning, as it does in cases of apoplexy or cerebral plethora. But that the amaurotic effects of the poisonous substances in question are to be ascribed wholly to congestion does not appear probable, when we take into account the dilatation of the pupils, which, often in the course of not many minutes, follows the application of belladonna to the skin of the eyelids, and which, whether it is to be regarded as produced by nervous communication or by absorption, can scarcely with any degree of plausibility be supposed to arise from cerebral oppression.

I have already had occasion repeatedly to hint my suspicion, that one of the narcotico-acrids, which custom has foolishly introduced into common use, namely tobacco, is a frequent cause of amaurosis. A majority of the amaurotic patients, by whom I have been consulted, have been in the habit of chewing, and still oftener of smoking, tobacco, in large quantities. It is difficult, of course, to prove that blindness is owing to any one particular cause, when perhaps several causes, favourable to its production, have for a length of time been acting on the individual; and it is especially difficult to trace the operation of a poison, daily applied to the body, for years, in such quantities as to produce, at a time, only a very small amount of deleterious influence, the accumulative effect being at last merely the insensibility of a certain set of nervous organs. At the same time, we are familiar with the consequences of minute portions of other poisons, which are permitted to operate for a length of time on the constitution, such as alcohol, opium, lead, arsenic, mercury, &c.; and we can scarcely doubt, that a poison so deleterious as tobacco, must also produce its own peculiar injurious effects.

The essential oil of tobacco is so virulent a poison, that small animals are almost instantly killed, when wounded by a needle dipped in it, or when a few drops of it are let fall upon their tongue. Dr. Paris[52] records the case of a child, whose death was occasioned by her having swallowed a portion of half-smoked tobacco, which was taken from the pipe of her father, and in which there no doubt existed a quantity of essential oil, which had been separated by the act of smoking; for in the process of smoking, the oil is separated, and being rendered empyreumatic by heat, is thus applied to the fauces in its most active state. That the regular application, in this way, of a poison of such power, perhaps five or six times daily for months or years together, should at length be productive of serious effects on the nervous system, and especially on the brain, cannot surely be matter of wonder. Indeed it would be surprising if it were otherwise.

Dr. Prout supposes some poisonous principle to be developed in certain individuals by tobacco. Hence their cachectic looks, and the dark, and often greenish yellow tint of their blood. He believes tobacco to disorder the assimilating functions in general, but particularly the assimilation of the saccharine principle. "It happens with tobacco," says he, "as with deleterious articles of diet; the strong and healthy suffer comparatively little, while the weak and predisposed to disease fall victims to its poisonous operation."[53]

In estimating the bad effects of tobacco, the loss of saliva which the use of it, by chewing or smoking, occasions, must be taken into account.

The Germans accuse a variety of bitter substances, employed either for food or medicine, as productive of amaurosis; but with what degree of justice, I cannot pretend to say. Beer enumerates bitter almonds, the root of succory, quassia, and centaurium, amongst this class.

Lead-colic is not unfrequently attended by amaurosis, as well as by deafness, vertigo, delirium, epilepsy, and other nervous symptoms.[54]

Treatment. 1. If amaurosis be the consequence of a large dose of a narcotic, which still remains in the stomach, we ought in general to begin by giving a dose of tartar emetic, or sulphate of zinc, in as small a quantity of water as possible; for, as long as the narcotic remains in the stomach, the addition of any fluid which would not immediately be rendered by vomiting, would only dissolve the poison, if it has been swallowed in the solid state, and add to its activity. Vinegar, especially, which has been found so useful in removing the disease which arises from opium, only adds to its activity, if it be given before the poison has been rendered from the stomach. When no danger, however, of this kind, is to be apprehended, as is the case in alcoholic poisoning, injections into the stomach, by means of the stomach-pump, and the immediate abstraction of the injected fluid, along with the poisonous substance, are to be preferred. After the contents of the stomach have been evacuated, a strong purgative ought to be administered, especially if we suspect that the narcotic has begun to traverse the intestines.

2. Blood-letting, both general and local, is of great use in cases of amaurosis from narcotic poisons. This remedy probably proves serviceable, chiefly by relieving the tendency to cerebral congestion, which uniformly accompanies the amaurosis.

3. The disease produced by the narcotic, and of which the amaurosis is a part, ought next to be combated by strong doses of coffee, camphor, vinegar, and the vegetable acids.

4. Cold applications to the head and eyes have been found useful. The cold affusion on the head is particularly advantageous, when the symptoms are owing to the ingestion of opium or of alcohol.

5. In inveterate cases, after premising blood-letting and purging,

a course of mercury may be tried, with counter-irritation of different sorts, sternutatories, and electricity. The prognosis in this stage, is very unfavourable, if the pupils are fixed, the retina insensible, and the external vessels of the eye varicose.

6. The purgative plan of curing lead-colic is generally successful in removing the amaurosis, which sometimes attends that complaint.

Case 918. — On the 24th May, 1815, Mr. J. H. aged 19, unaccustomed, except for a day or two before, to the effects of tobacco, smoked one, and a part of a second pipe, without employing the usual caution of spitting out the saliva; and partook, at the same time, of a little porter. He became affected by syncope, with violent retching and vomiting. He returned home, complained of pain in the head, undressed, and went to bed. Soon afterwards he was taken with stupor and laborious breathing. The medical attendant found him in the following state: —The countenance was suffused with a deep livid colour; the eyes had lost their brilliancy; the conjunctivæ were injected; the right pupil was exceedingly contracted; the left was much larger than usual, and had lost its circular form; both were unaffected on the approach of light. The hands were joined, and in a state of rigidity; the arms bound over the chest; and the whole body affected with spasmodic contraction. The breathing was stertorous; pulse about 80 or 82, and nearly natural in other respects. No more vomiting; no stool or urine passed; no palsy.

Fourteen ounces of blood were immediately taken from the temporal artery, and vinegar was administered. He revived evidently; the countenance became less livid; the spasmodic affection of the hands ceased; respiration became less stertorous. An ipecacuanha emetic was given, and operated once, and afterwards some purgative medicine was administered.

He dozed through the night. Next morning he was affected with syncope, during the efforts made to get out of bed to go to stool. He complained very much of pain of the head and eyes; the eyes and eyelids appeared red and suffused. Tongue loaded and brownish. One stool. Pulse 80 and natural. Continued to doze. The feet cold in the morning. Sixteen ounces of blood were taken from the arm.

On the third day, he still dozed, and complained of pain in the head, nausea, and a tendency to faint. Countenance more natural; pupils natural, and contract on exposure to light. Pulse 72. A loose stool passed insensibly in bed. In the evening, he again became affected with a degree of stupor, spasms of the hands, and stertor in breathing. Six ounces of blood were drawn from the temporal artery, vinegar was given, a blister applied to the forehead, and mustard cataplasms to the feet, with much relief to the symptoms.

On the fourth day, he appeared much as on the preceding morning. There was some pain of head, but no sickness or vomiting. After this he gradually recovered.[55]

Such is an instance of acute amaurosis from tobacco; chronic cases may be met with every day at any Eye Infirmary, generally in that stage in which there is reason to suppose the retina and optic nerve to be more or less in a state of atrophy.

One of the best proofs of tobacco being a cause of amaurosis is in the great improvement in vision — sometimes complete restoration — which ensues on giving up the use of this poison. A man, having called on me, who was rapidly becoming blind, I explained to him that the cause was the smoking of tobacco, and seriously advised him to drop it. He returned some months after, in great spirits, so well that he was able to read. My advice had produced a deep impression on his mind, he had used no medicine, but had from that hour renounced tobacco, and came to thank me. Such a case is rare; so wedded are those who use tobacco to the indulgence, that it may literally be said that they would rather smoke than see. To attempt to cure by medical means the amaurosis of such persons, while they persist in subjecting themselves to the cause of the disease, is idle.

§ 18. *Amaurosis from congestion or inflammation of the nervous optic apparatus, depending on acute or chronic disorders of the digestive organs.*

Many of those who are liable to dyspepsia make mention of certain symptoms affecting the organs of vision; as, distension and stiffness of the eyeballs, dazzling and mistiness before the eyes, muscæ volitantes, and the like. These symptoms are generally attended by headache, and sometimes by vertigo, and gradually subside as the stomach recovers its wonted activity. The French distinguish by the name of *éblouissement*, a sudden temporary loss of sight, sometimes nearly complete, and attended generally with severe pain in the stomach and sometimes in the forehead. Such fits occur from time to time in the course of the day. They alarm the patient, especially when they suddenly attack him in the street. In some cases, the sympathetic effects of indigestion are not so transient, consisting in dilatation of the pupils, sluggishness in the motions of the iris, and a continued dimness of sight. The patient complains, at the same time, of constant acid or foul eructations, with painful heartburn, a feeling of pressure at the scrobiculus cordis, distension of the abdomen, a great degree of flatulence, thirst, nausea, general uneasiness and restlessness; the mouth is bitter, the tongue foul, and the pulse accelerated.

All these symptoms, including, among the rest, the amaurotic, speedily subside, in general, after the use of some absorbent and laxative medicine, as magnesia usta, or the carbonate of magnesia, a mixture of these with rhubarb and ginger, or the like. Those who are subject to *éblouissement*, have recourse to a dose of calomel, followed by a purge, which frees them from such attacks for a time.

In some instances, it is between the optic apparatus and the bowels, more than the stomach, that the sympathy exists, which gives rise to temporary amaurosis. Tiedemann[56] quotes from Helwich the case of a hypochondriacal man who became blind under severe spasmodic attacks with costiveness. After the use of clysters, the blindness left him.

Frequently-repeated and neglected attacks, however, of the kind above noticed, especially in sedentary persons, careless perhaps of their diet, and inattentive to the means of preserving health, lead at last to more serious consequences. The optic apparatus is at first affected only with a sympathetic congestion, but as in all other sympathetic affections, if often repeated, the eye retains at length the morbid action, and permanent amaurosis is developed. Each succeeding attack of the purely sympathetic kind continues longer than the preceding, and at last the congestion of the brain ends in such structural changes as do not yield to mere evacuations of the stomach and bowels. The bowels grow habitually inactive, the biliary organs are impeded in the discharge of their office, the appetite is impaired, digestion weakened, the mind becomes habitually fretful, and the spirits depressed. Under such circumstances, allowed to continue without interruption for years, there is not unfrequently produced a slowly increasing weakness of sight, terminating at last in confirmed amaurosis. In Milton, whose case I apprehend to have been one of this sort, the affection of vision went on for ten years before it ended in blindness; and it sometimes happens, that even a longer period elapses, before the disease is fully developed. The patient during all this time, complains of a constantly increasing imperfection of sight, without being rendered unable, perhaps, to continue his usual employments. Though generally slow in its progress, yet there sometimes occur cases, in which this species of amaurosis is rapid, or even metastatic.

The pupil is dilated, the motions of the iris very sluggish and limited, the sclerotica tinged of a yellowish or dusky hue, the vessels of the conjunctiva often turgescent. Every object seems to the patient to be enveloped in a thick cloud, and not unfrequently he sees only parts of the objects at which he is looking. Dull, stupifying headache generally accompanies the failure of sight, extending over the whole head, and depriving the patient, even when a considerable share of vision remains, of all pleasure in those employments which require the exercise at once of sight and thought.

Amaurosis, arising from disorders of the digestive organs, is not always easily distinguished from that which depends on structural changes in the encephalon, attended with a train of symptoms which are referred to the stomach, but which really depend on disease in the brain. Patients are very apt to deceive themselves under such circumstances, regarding the seat of their diseases. They perhaps refer all their sufferings to the stomach, but after death, not a trace of disease is detected in the viscera of the abdomen, while, in the membranes, or in the substance of the brain, there are indubitable marks of such structural changes of long standing, as were sufficient to produce the amaurotic affection, and must at the same time have operated sympathetically on the stomach.

Treatment.—A relinquishment of whatever appears to have laid the foundation of the affection of the digestive organs is the most important particular in the treatment of this amaurosis; whether the cause has been severe and protracted study, irregularities in diet, the use of alcoholic and other poisons, want of exercise, impure air, or the like. The patient's food should be plain and easily digested, he must pay particular attention to keep his bowels regular, he ought to take daily exercise in the country on foot or on horseback, and court the society of the cheerful and well-informed.

Depletion, and especially the application of leeches to the temples, will be found of much service. The head is to be shaved, and kept wet with cold cloths. Counter-irritation, by blisters behind the ears, is sometimes necessary. Alterative doses of mercury will often be useful, and much advantage will be reaped from the use of tonic medicines, judiciously selected and combined.

Beer strongly dissuades from the use of emetics and nauseating medicines in the treatment of amaurosis depending on chronic disorder of the digestive organs; also, from all external stimulants, and from electricity or galvanism.

Case 919.—Scarpa relates the case of a girl, aged 16 years, of delicate constitution, and who had not menstruated, who towards the end of May became affected with such a degree of morbid appetite that she could scarcely satisfy it by swallowing every sort of gross food in large quantity, especially bread made of Indian corn. Fatigued, also, by the hard labour of the country, to which she was not yet accustomed, her sight began to grow dim. Her immoderate appetite suddenly ceased, she felt a bitter taste in her mouth, and began to experience a sense of weight in the region of the stomach, accompanied by nausea and continual headache. She then lost the sight of the right eye entirely, and in a great measure that of the left. The pupils were considerably dilated, and almost immoveable to the strongest light. She seemed, also, as if she had an incipient strabismus.

On the 4th of June, she took, in table-spoonfuls, a solution of 4 grains of tartar emetic in 5 ounces of water, which produced a great and continued degree of nausea, but no vomiting, except of a little viscid whitish matter. On the 5th, the same emetic was repeated in the same manner. It produced a more copious vomiting than on the preceding day; but always of mucous whitish matter. The headache was considerably relieved, as well as the sense of weight in the region of the stomach. The nausea, however, and furred tongue continued as at first. The pupil appeared a little moveable to bright light, and with the right eye the patient could distinguish whether it was light or dark. She began to expose the eyes to the vapour of ammonia every two or three hours. On the 6th, she had little pain in the head, and the mouth was less bitter. The pupil had acquired some degree of motion. She was ordered to continue the ammoniacal vapour, and to take three resolvent powders, consisting of cream of tartar with a small proportion of tartar emetic, daily. On the 7th, she had very little headache. The powders produced nausea for some hours, then two copious stools. The pupil contracted a little, and the patient could discern the outlines of large objects. By the 8th, the headache was entirely gone, as well as the bitter taste and furred state of the tongue. The pupil also was more sensible. The patient continued to take the resolvent powders on the 9th, 10th, 11th, and 12th, and to use the ammonia. On the 13th, she complained again of headache and bitterness of the mouth, with foul tongue. Instead of the powders, Scarpa prescribed an emetic of half a drachm of ipecacuanha with a grain of tartar emetic; in consequence of which the patient vomited much yellowish-green matter. The headache ceased immediately, and the girl could then distinguish sufficiently well the objects that were presented to her. On the 14th, she felt herself very well. The pupil of the right eye, which had been the most amaurotic, was even more contracted than that of the left. On the 15th, the patient resumed the use of the resolvent powders, and continued the external application of the ammoniacal vapour. On the 16th, she could distinguish with the right eye a small needle. During the 17th, 18th, 19th, and 20th, the powders produced two copious stools daily, without at all weakening the patient. She had a good appetite, and digested well. On the 21st, a decoction of cinchona, with infusion of valerian root, was substituted for the resolvent powders. She was able in a few days to see the most minute objects, as well with the one eye as the other. She had acquired a good complexion, and the strabismus had almost entirely disappeared. She was dismissed perfectly cured, but advised to continue the use of the vapour for a week longer, to take morning and evening a powder, composed of one drachm of cinchona, and half a drachm of valerian, to observe a regular diet, and to avoid the scorching rays of the sun.[57]

Case 920.—A gentleman of feeble habit, was subject to occasional attacks of obstinate constipation, each accompanied by amblyopia, sometimes proceeding to complete amaurosis. When Mr. Edwards was first called to visit this patient, he found him completely amaurotic. He had some time before complained of excruciating headache, and every solid and fluid medicine directed by his medical attendant had been rejected by his stomach. To the previously existing amblyopia complete amaurosis succeeded, during the vomiting, which may be called spontaneous, in contradistinction to that produced by an emetic in another attack. The patient now became delirious.

Leeches were applied to the abdomen, and the bowels were relieved by enemas. By these means, and the application of cold to the head, the patient fully and speedily regained his sight and faculties.

In this attack, the co-existence of headache and delirium, and the recovery by antiphlogistic treatment, Mr. Edwards considered as sufficiently indicative of active local congestion, or incipient inflammation in the nervous structure of the eyes. This was coincident with great debility, and the amaurosis was not completed till vomiting occurred.

After an interval of six weeks, another attack of visceral obstruction succeeded:

the accompanying amaurosis was incomplete; vomiting was absent. The amaurotic affection lingered for a considerable time, surviving the removal by enemas, &c. of the primary irritant longer than in the preceding attack, in which the vascular congestion was almost purely sympathetic and temporary.

By some errors in regimen, the patient in a few weeks again relapsed. There were constipation, tense hypochondria, nausea, headache, and amblyopia. Mr. Edwards now tried the continental practice, by giving an emetic. The result was a discharge of much yellow-greenish matter, but the amaurosis immediately became complete. The bowels were relieved by enemas, but still the blindness continued much longer than in any previous attack, and was only at length removed by the application of many leeches to the temples, and continued evaporating lotions to the head.

In each of the attacks, the degree of amaurosis was determined by the presence or absence of vomiting, the complete being synchronous with spontaneous vomiting, as in the first attack, and with the action of an emetic, as in the last; where there was no emetic action as in the second attack, the amaurosis was incomplete.

Mr. Edwards considers the emetic practice to be contra-indicated in amaurotic affections, alleging in support of this opinion, the tendency of obstinate vomiting, in incipient pregnancy, to cause amblyopia or even complete amaurosis.[58]

Case 921.—Thomas Crighton, aged 23, was admitted into St. Bartholomew's Hospital, on account of a palsy of his limbs. About a year before, while the use of his limbs was yet unimpaired, he was attacked repeatedly with violent pain in the bowels, uniformly preceded by costiveness, and, generally, terminated by a copious discharge of loose, fœtid, black stools. The relief afforded by the diarrhœa was speedy and uniform. In the course of six months his lower extremities became affected with occasional twitchings, and he found that he could not regulate their motions in walking: this increased to such a degree as to make him incapable of taking any exercise. He had, at the commencement of his illness, a confusion of vision, and a constant and violent pain in the head. The former symptom increased so much, that he could discern no object distinctly: a candle, for instance, although held near him, appeared as large as the moon. The sensation of his lower extremities continued perfect; but the actions of the bladder were no longer under the control of the will: the urine sometimes flowed involuntarily, and, at others, was retained for some hours, with considerable pain. He afterwards began to lose the use of his upper extremities: the left hand and arm were more affected than the right; but there was no difference in the affection of the leg on the same side. His speech, also, became much impaired; he hesitated and faltered considerably, and the tones of his voice were irregular, so that, at length, he could scarcely make himself understood. At the time of his admission into the hospital, there was an entire loss of voluntary motion of the lower extremities, and a great diminution of that of the upper. The bowels were deranged; there was constant headache; the speech was very indistinct; and vision so imperfect, that he could not read the largest print.

An issue was made in the neck, and some medicines were prescribed, under the direction of the physician. As the treatment did not prove beneficial, Mr. Abernethy was desired to examine the spine, and found such a curvature and projection of the spinous processes of the upper lumbar and lower dorsal vertebræ, that he thought the bodies of those bones were diseased. He was, therefore, inclined to attribute the paralysis of the lower extremities to the disease of the spine; and, consequently, directed, that issues should be made on each side of the projecting vertebræ. As this supposition would not account for the paralytic affection of the parts above, and as the bowels were deranged, Mr. Abernethy ordered two grains of calomel with eight of rhubarb, to be taken twice a-week, and some infusion of gentian, with senna, occasionally.

After using these medicines for about three weeks, the patient's bowels became regular, the biliary secretion healthy, and his appetite good. He could move his hands and arms nearly as well as ever; and his eyesight was so much improved that he could read a newspaper; indeed, it was nearly well. The functions of the bladder were completely restored; his speech became articulate; and his general health, in every respect much improved. He remained in the hospital about two months, but with very little amendment in the state of the lower extremities.[59]

Case 922.—Elizabeth Healey, a slender delicate young woman, about 25, of a sedentary occupation, emaciated figure, and feeble melancholic temperament, applied to Mr. Lessey on the 9th of June, 1820, for an affection of the bowels, to which she had been liable for several years, requiring, even in a state of comparative convalescence, the constant use of purgatives. Indeed, the derangement of the abdominal viscera was so great and permanent, as to induce a belief that it was of an organic nature. In addition she was liable to frequent and severe cephalalgia, and occasionally to attacks of dyspnœa, with spasms of the chest and throat, which, on her attempting to swallow, produced alarming symptoms of suffocation. These attacks were sudden and violent, attended by great feebleness of the voice, and succeeded by exhaustion. Her bowels had been frequently relieved by mercurial and saline cathartics, the attacks of cephalalgia by venesection and the application of leeches and blisters to the head and neck, and the affection of the lungs by a variety of remedies. She had an attack of disordered bowels in January, 1821, which appeared to be yielding to remedies, when she was suddenly seized, on the 23rd, with violent dyspnœa. Every attempt to swallow, or even to speak, was followed by a convulsive spasm of the throat and chest, attended with frequent sobbing.[60] A few doses of ether and opium, with a blister on the sternum, relieved the immediate urgency of the symptoms; but still the breathing continued laborious, and the voice, which had long been feeble, was reduced to a scarcely audible whisper. The derangement of her abdominal viscera returned; her stools were green and slimy; her pulse was feeble, and her general debility so great, that Mr. Lessey despaired of her recovery.

She remained in this state, with little variation, till the 15th of February, when the difficulty of breathing suddenly left her, and her voice became distinct, strong, and clear; but a sudden and violent pain seized her head, and, to the astonishment of the people around her, she screamed out loudly for help. Hastening to her assistance, they found her in an agony of pain, and quite blind. Mr. Lessey immediately ordered her head to be shaved, and a blister applied to it, with a dozen of leeches to the temples, which abated the violence of the pain, but produced no alteration in her sight. The eyes were fixed and nearly motionless; the pupil steady at a medium point, between contraction and dilatation, and totally insensible to light. On presenting a candle suddenly to her eyes, she exhibited no consciousness of its presence, unless it was sufficiently near for her to feel the warmth of its rays. Blisters were applied to her temples, dressed with cantharides ointment, and frequently repeated, so as to keep up a discharge for weeks. The bowels continued torpid, and required the constant use of purgatives. Blue pill was next tried, and her gums were slightly affected, but without any effect on the sight. Her voice continued strong, her breathing easy, and, in fact, the affection of the chest appeared to have left her entirely. The pain in the head was considerably abated, but the vision remained so entirely lost, that all hopes of its recovery were abandoned, and she was sent to the Manchester workhouse, as an incurable amaurotic.

Three months after her admission, she had a severe attack both in her chest and bowels, obstinate constipation, dyspnœa, with violent spasm and great difficulty of swallowing. This attack lasted three weeks and subsided slowly. At the latter end of 1822, she had a slight attack of pleurisy, which yielded to bleeding, blistering, and the usual treatment; after which she remained tolerably free from all her complaints, excepting slight headaches.

Although she entertained little or no hope of again recovering her sight, yet she occasionally tried her eyes with a candle. On the evening of the 29th of October she perceived no glimmering whatever; but, to her great surprise, on the following evening, as a person was conducting her through the streets, she saw a confused appearance of fire, and exclaimed, *What is the matter with my eyes?* In the course of a few minutes she discovered that it proceeded from the gas lamps, which she saw indistinctly. Her sight gradually improved during the course of the evening. Next day, Mr. Lessey found that there was considerable mistiness and obscurity in her vision, with muscæ volitantes of a fiery hue; but that she could distinguish the features of her acquaintances, and could even read the large capitals of a hand-bill, the smaller print seeming confused and blended together. All distant objects were mixed up with coloured mists, and consequently indistinct and confused.

On the 20th of November her sight remained much the same. It had got better, however, during the interval; but was injured again by injudicious exposure to a highly heated room. The coloured mists still troubled her occasionally; the muscæ volitantes were sometimes very numerous, and appeared mixed, she said, with white flakes like snow. She could not read better; but with the help of a double-concave glass, she could distinguish print which to her naked eye was a confused mass. Her bowels and lungs had been free from disease for twelve months, and she exulted in the prospect of ultimate recovery.[61]

§ 19. *Amaurosis from congestion or inflammation of the nervous optic apparatus, arising from continued loss of the fluids of the body.*

This species of amaurosis declares itself from its commencement by the sensation of a net-work before the eyes, seldom, if ever, attended by that glittering or dazzling which accompanies the same symptom in some other varieties of the disease. In a gentleman by whom I was consulted, and who blamed excessive indulgence in venery as the cause of his blindness, there was no photopsia, or revolving of globes of light before the eyes; but the sensation of a cloud, which crept first over the one eye and then over the other, from the temple towards the nose, as if the nasal part of the retinæ became first insensible. During the progress of the disease the power of vision manifests remarkable differences in degree, according to the physical and moral influences which affect the individual. After a hearty meal, or a few glasses of wine, or during the influence of some unexpected elation of mind, the patient sees, for a short time, much better than he did before; while an opposite effect is produced by the depressing passions, want of food, continued watching, and the like. Not unfrequently, this amaurosis first declares itself by the sensation of a mist before the eyes in the evenings, the common artificial light being too weak to stimulate sufficiently the diminished sensibility of the nervous apparatus of vision. There is seldom any complaint of pain, either in the head or in the eyes, or any feeling of fulness or weight. The symptoms generally creep on very slowly. The patients are often melancholic, timid, and hypochondriacal; they are subject to vertigo, loss of memory, incapacity for mental exertion, capriciousness, sleeplessness, gastralgia, want of appetite, flatulence, and constipation. There are rarely any objective symptoms, except, perhaps, dilated pupils, attended by evident general debility, paleness, emaciation, palpitation of the heart, and a weak, small, and frequent pulse.

Causes.—Among the most frequent causes of this amaurosis may be mentioned imperfect nutrition, any considerable and continued loss of the fluids of the body, such as occurs in hæmorrhagy, ptyalism, chronic diarrhœa, or from immoderate venery, spermatorrhœa, onanism, undue lactation, leucorrhœa, the abuse of reducing remedies, and the like.[62] It is occasionally a sequela of typhus fever, especially when this disease has been attended by profuse epistaxis, or treated with remedies producing hypercatharsis. Grief, desponding and other depressing passions, produce wasting of the body, with cerebral congestion, and amaurosis.

It has already been mentioned, that plethoric persons are in general able to produce a degree of congestive amaurosis at will, by stooping, for example, or by tying their neckcloth tight. We also frequently witness a temporary amaurosis of an opposite kind,—namely, from exhaustion. Amongst the symptoms enumerated as caused by loss of blood in pregnant females before labour, we find vertigo, singing in the ears, and impaired vision. If the nervous system is the seat of no particular excitement at the time, we observe that on the sudden abstraction of blood by phlebotomy, the organs of vision, and indeed all the organs of sense, are strikingly enfeebled. In some individuals the debility continues for several days; and if any one of the organs of sense has been previously weaker than the rest, the feebleness of that organ is often increased. When syncope is produced by loss of blood, sight appears to be the sense which fails first, and which recovers last. Hearing is next; while smell, taste, and touch are less affected, and more easily reanimated, by excitation. They return in a very short time to their natural state; but it is not so with sight. It is a popular opinion, that blood-letting weakens the sight, and to a certain length the opinion is founded on fact.

Treatment.—The general object of the treatment is, by diet and tonic remedies, to strengthen the digestive organs and remove the debility of the patient. Although it is but too true, that the amaurosis does not always yield, even when the bodily strength of the patient is renewed, still the utmost care must be paid that debilitating discharges are restrained, and bad practices on the part of the patient avoided; while country air, moderate exercise, the cold bath, and every other general influence likely to restore vigour, are employed.

When spermatic discharges are the cause, the plan of cauterising the prostatic part of the urethra, recommended by Lallemand[63], may be tried, and followed up with tonics.

Some of the causes already referred to, unquestionably produce cerebral congestion, which, notwithstanding the debilitated condition of the constitution, requires the application of leeches to the head and of counter irritation. Mr. Wade recommends[64] moxas burnt slowly over the integuments of the head, a practice not altogether safe, as it has been known to cause caries of the bones, and consequent death.[65]

Local stimulants, such as ethereal vapours directed against the eyes, have been found of use in such cases.

Success in treating this disease will depend much on the practitioner's discovering the particular debilitating cause from which it has originated; and when the disease is recent, the mere avoidance of the cause will frequently be sufficient to arrest its progress. When lactation, for instance, is the cause, weaning of the child is the principal remedy.

Case 923.—Arrachart relates the case of a young man, who had all his life been accustomed to drink wine as his ordinary beverage, but who, from change of place, was obliged to drink water. The consequence was diarrhœa, which continued for nine months, when the patient was seized with fever of intermittent character. For this he was bled twice at the arm, and from that moment his sight began to fail. A third bleeding, from the foot, sensibly increased the weakness of sight, and immediately after a fourth bleeding, also from the foot, the patient became altogether blind. Large blisters were applied, and tartar emetic given, first of all as a vomit, and then as an alterative, during more than a month, without any success. The exhaustion of the patient rapidly increased, and still the tartar emetic was repeatedly employed. When Arrachart was called in, he prescribed mild, nourishing, and easily-digested food, and put a seton into the neck. The patient's health began to improve, but his vision remaining as before, he still continued to take six-grain doses of tartar emetic, without Arrachart's knowledge. These produced convulsions, without any evacuation. Arrachart having discovered this, prescribed some anodyne and antispasmodic remedies, and recommenced the nourishing plan of diet. In two months the patient began to see a little with the left eye, and during the course of the next three months the vision of that eye sensibly improved, but the right eye remained blind.[66]

Case 924. — A mason was admitted into the *Hôtel-Dieu*, under the care of Dupuytren, having found himself deprived of sight the day after his wedding. The cold bath, irritating friction over the dorso-lumbar region, and diffusible tonics internally, were employed, and vision was speedily restored.[67]

Case 925. — A country lad, of robust constitution, became the alternately favoured paramour of two females, his fellow-servants, under the same roof. He was the subject of gutta serena in less than a twelvemonth.[68]

Case 926. — Another, at an early period of puberty, suddenly fell into a despondency, and shunned society. He never left his chamber but when the shade of night concealed him from observation, and then selected an unfrequented path. It was not discovered till too late, that in addition to other signs of nervous exhaustion, a palsy of the retina was the consequence of habitual masturbation.[69]

Case 927. — Elizabeth Firman, aged 20, applied to Mr. Wells, on the 28th January, 1832, with total loss of sight, complete palsy of the left, and partial palsy of the right upper eyelid. From the leucophlegmatic and relaxed appearance of the patient, Mr. Wells was led to suspect that leucorrhœa was perhaps the principal cause of her complaints, and on inquiry learned that, commencing to menstruate at the age of 16, she had continued to do so regularly for upwards of 18 months, after which period she became very irregular, and had an excessive mucous discharge, which had greatly impaired her constitution.

About two years before consulting Mr. W., she had a severe ophthalmia, but which quickly got well under treatment. Shortly after this, palsy of the eyelids supervened, and vision gradually became very obscure, until it was wholly lost, first in the left eye, and soon after in the right. When the eyelid was raised, and the light allowed to pass on to the retina, neither contraction nor dilatation of the pupil followed, but the patient complained of great pain at the back part of the orbit. The pupil had an oval shape, with an irregular edge.

For 12 or 18 months before consulting Mr. Wells, the patient had pain in the left side, behind and below the false ribs.

During the course of the disease, she was admitted into a public hospital, where she remained for eleven weeks, and was treated by cupping, blistering, and mercury, but without benefit. She also tried electricity, but with no better success. On the contrary, the symptoms increased under those means, and the left eye became totally insensible to the strongest light.

Although of opinion that the whole symptoms arose from the affection of the genital system, Mr. Wells also felt assured of the existence of cerebral congestion, and therefore began his treatment of the case with taking blood from the nape of the neck by cupping, followed by a brisk purge of calomel and jalap.

Some days after, the skin being dry, and the tongue furred, he ordered ten grains of nitre thrice a day, and every night five grains of extract of hyoscyamus, five of compound extract of colocynth, and two of blue pill. A solution of alum and sulphate of zinc was directed to be injected into the vagina thrice a day. In this plan, with the use of occasional purgatives, the patient persevered for more than a month, with but little change in the symptoms. As she then complained of pain at the back of the head, she was bled at the arm to 18 ounces, and the first purgative was repeated. She was ordered strictly to attend to the injection, and to take the night pills for another month. This she did, and with good effect, as, by the end of that time, she was able to raise one eyelid, and with one eye could distinguish objects. Eleven weeks from the time Mr. Wells first saw her, she felt a sharp pain, which she explained to be as if something had suddenly parted at the back part of the head; and at that moment a slight glimmer of light was first experienced with the other eye. Mr. Wells bled her again to 12 ounces; and the power of vision went on gradually to return.

Four months from the period of commencing the injection, she was able to read and work, and her health was greatly improved. When Mr. Wells drew up the case, she was as well as ever she had been in her life; the leucorrhœa had entirely ceased, and menstruation had become regular. He mentions, that in addition to the pills, half a drachm of carbonate of iron was administered thrice a day, when the vision began to return.[70]

Case 928. — Mrs. S. when in her 30th year was brought to bed; and being a woman of a healthy constitution, chose to suckle her child herself. This she did for some time, without feeling any inconvenience from it; but, having continued it for six weeks, her strength began to fail, and continued to decline daily till she became incapable even of moving about the house, without experiencing a very painful languor. About the same time, her sight also was affected; at first only in a small degree, but afterwards so considerably, that the full glare of the midday sun appeared to her no stronger than the light of the moon. At this period of her disorder, no black specks were perceived with either eye, nor did objects at any time appear covered with a mist or cloud. She was affected with a violent pain in the neck, running upwards to the side of the head; and, on this account, the person who attended her thought proper to take four ounces of blood, by cupping, from the part first affected. After this her sight was worse than before, and it was not long before she entirely lost the use of both eyes.

She had been three days in this state of blindness, when Mr. Wathen was first desired to see her. He found both pupils very much dilated, and remaining unaltered in the brightest light. His first advice was, that the child should be weaned without loss of time. He ordered, at the same time, bark draughts to be taken by the mother three times in the day, prescribing also an opening medicine to be taken occasionally, on account of a costive habit of body, to which she had been almost constantly subject ever since the time of her delivery. To the use of these remedies was added the frequent application of the vapour of ether to the eyes and forehead.

On the fourth day after this mode of treatment was adopted, Mr. Ware visited the patient, with Mr. Wathen. From the account she gave of herself, her strength and spirits seemed to be in some degree on the return; and she could now perceive faint glimmerings of light, though the pupils of both eyes were in the same dilated and fixed state as before. The bark and ether were continued, and next day a strong stream of the electric fluid was poured on the eyes, whilst several small electric sparks were variously pointed about the forehead and temples. The day after this, to increase the effect of the electricity, the patient was placed on a glass-footed stool, and the same experiments repeated as before. This appeared to have a considerable influence in promoting the cure. The first trial was almost immediately followed by such a degree of amendment, that the patient, to whose sight every object had before been confused, could now clearly distinguish how many windows there were in the room where she sat, though she was still unable to make out the frames of any of them. On the third day, soon after she had been thus electrified, the menstrual discharge came on for the first time since she had been brought to bed, and continued three days, during which it was thought proper to suspend the use both of the bark and the electricity. Immediately after this they were resumed; and the effect was that the sight mended daily. At the end of a week, she could perceive all large objects; and in a short time she could read even the smallest print. Her strength, indeed, did not return so quickly; on which account she was advised to remove into the country, where the change of air, with the help of a mild nutritious diet, soon restored her to perfect health.[71]

§ 20. *Amaurosis from Albuminuria.*

It was pointed out by Dr. Addison[72], that the form of cerebral disorder which most commonly supervenes in the progress of the morbid change of the kidney, called Bright's disease, or albuminuria, is very frequently preceded by giddiness, dimness of sight, and pain in the head; and it has since been announced[73] by Dr. Landouzy, of Rheims, that, among the signs of that disease, deterioration of vision is an initial one, and one which returns or disappears as the albumen does in the urine. The affection of sight comes on insensibly, and never amounts to total blindness. It is attended by puffiness of the eyelids, and frequently by diplopia. The pupils are dilated, the patient complains of the light, and sees as if through a veil. Pain in the lumbar region, œdema of the lower extremities, ascites and hydrothorax supervene.

Excess in alcoholic drinks, premature venereal indulgences, living or working in damp cold places, imperfect nourishment and excessive fatigue, are the causes to which Dr. Landouzy has traced the disease.

Should amaurosis appear in combination with signs of hyperæmia or inflammation of the kidney, which constitutes the first stage of albuminuria, depletion, diuretics, and counter-irritation will be proper; if it occur in the second stage, which is one of decided alteration of structure, and of the development of morbid products in the kidney, the use of diuretics must be persisted in, along with active counter-irritation, and the cautious employment of alteratives. In both stages, advantage is likely to be obtained from the employment of the vapour bath. Mercury affects those labouring under albuminuria with more than ordinary violence, and must be given, if given at all, with great circumspection.

§ 21. *Amaurosis from irritation of branches of the fifth nerve.*

Congestion of the nervous optic apparatus, excited by irritation of the fifth nerve, appears to be by no means an unfrequent cause of sympathetic amaurosis; numerous instances being on record, in which the removal of tumours in contact with branches of the fifth nerve, or of carious teeth, has been the means of restoring sight.

Case 929. — A healthy middle-aged man, a ship-painter by trade, desired Mr. Howship's advice, in 1808, on account of a small tumour situated on the crown of the head. It was at least ten years since he had first perceived it. He supposed it might have been the consequence of some blow on the part, as those in his line of business were very subject to such accidents. It had never been painful, but yet he thought his general health was giving way, as for some years he had been subject to headache, a complaint he was never afflicted with before. The frequency of the headache was increasing, and his sight had become so weak, that for more than two years he had been totally unable to read even the largest and clearest print. On pressure, no pain, or even sense of feeling, was excited in the tumour on the scalp.

Mr. Howship advised extirpation, which was done accordingly, by two elliptical incisions through the integuments beyond the basis of the tumour, the portion of included scalp, with the tumour itself, being subsequently dissected away from the pericranium, with which it was in contact. Two small vessels were tied, and the integuments brought nearly together, with adhesive plaister. In three weeks the wound was perfectly healed.

On examination, the tumour proved to be a strong cartilaginous cyst, seated in the cellular membrane beneath the scalp. The cavity of the cyst was filled with a yellow purulent fluid; the thick parts of which had formed a curdy deposit upon the sides of the cavity.

The patient had not lost above an ounce of blood in the operation, but he rather unexpectedly felt his head better the following evening, than for many months before. He found his uneasiness and pain in the head continue to diminish from day to day, and stated, with some degree of surprise, that he had also found his sight becoming much stronger, and clearer. By the time the wound was healed, he had lost all remains of pain in his head, and his sight was so greatly improved, that he was now again able to read the same small printed book that he had been in the habit of using ten years before; nor did the pain in the head, or the affections of the sight afterwards return.[74]

Case 930. — F. Przesmycki, aged 30, who had always enjoyed good health, with the exception of occasional rheumatic pains in the head and joints, was suddenly seized, in the autumn of 1825, with violent pain shooting from the left temple to the eye and side of the face. This pain was attributed to cold; it lasted several days, and then subsided, returning periodically without being so severe as to lead him to consult a medical man. But in two months it recurred with such intensity, especially in the eye, that that organ appeared to the patient about to start from its socket, and at the same time he became sensible of having lost the power of vision on that side. This discovery induced him to have recourse to professional assistance, and for six months various plans of treatment were adopted, without any other advantage than that the pain became periodical instead of continual. At the expiration of this period, the pain acquired new force, the cheek became swollen, and during the night several spoonfuls of bloody pus were discharged from between the conjunctiva and the left lower eyelid; after which the swelling subsided, and the pain diminished, but the blindness remained as complete as before. In three weeks a similar discharge took place, and during the next six months it was occasionally repeated. In the winter of 1826, the disease was so severe, that at the commencement of 1827, the patient proceeded to Wilna, with the intention of having the eye removed, if he should find no other means of relief.

M. Galenzowski, who was now consulted, found the vision of the left eye lost, the pupil remaining dilated. He conceived that pus had formed in the maxillary sinus, and made its way along the orbital part of the superior maxillary bone; but knowing also that suppurations of the upper jaw frequently depend upon carious teeth, a careful examination was made, and a rotten tooth found, corresponding to the antrum. This tooth was extracted, to give a new outlet to the purulent matter, and to the astonishment of M. Galenzowski and his patient, there was found attached to its root a splinter of wood, about three inches long, and as thick as the head of a pin. The splinter is supposed to have been originally detached from a tooth-pick of wood, as no other probable explanation could be given. On withdrawing a probe, introduced into the antrum, there followed a few drops of sero-purulent fluid, and nine days afterwards the patient had completely regained his sight.[75]

Case 931. — Dr. Vanzandt, of St. Louis, United States, mentioned to me the case of a young man, affected with complete amaurosis, excited by the persistance of two deciduous teeth. As soon as they were extracted, the patient looked up as if terrified, and found his vision restored.

§ 22. *Hydrocephalic amaurosis.*

Hydrocephalus is either acute or chronic, and of each of these varieties, amaurosis is generally a symptom. The third ventricle, as well as the lateral ones, being dilated, its parietes bulge in front, so as to press upon the chiasma.

The acute hydrocephalus of infants is a disease which the oculist is seldom called upon to treat, as other serious symptoms generally precede the loss of sight. Strabismus, however, is not unfrequently the earliest sign of acute hydrocephalus; and occasionally it happens that loss of sight is the first symptom which creates alarm. Dr. Graves mentions[76] his being called to visit a patient, whom he found to be a fine boy, walking about in apparently good health, but quite blind. Here amaurosis was the first symptom; others followed; and the child died in a convulsive fit about a fortnight afterwards.

Frequent and severe headaches have generally been troublesome during a number of years, before an adult is seized with acute hydrocephalus; at last, one of the usual attacks is attended by signs of pressure on the brain, delirium, perversion of language, dilated insensible pupils, and blindness; coma follows, and death.

Depletion, mercurialization, and counter-irritation are the means of cure to be followed in adults.

In children, the disease is often connected with a scrofulous constitution, and the general health too much impaired to allow of exhausting remedies. If there is pain, throbbing, and heat in the head, with other signs of plethora or congestion, leeches are to be applied; the scalp is to be kept wet with a cold lotion; and the child is to be purged. Frequent small doses of the sulphate of quina should then be given, if the child is of a feeble constitution. If the disease has followed the suppression of any eruption, counter-irritation behind the ears, or on the nape of the neck, is to be employed.

Hydrocephaloid symptoms sometimes arise from exhaustion. The child is afflicted with stupor, the eyelids are partially shut, and are immoveable on the approach or even actual contact of the finger, the respiration is irregular, and the pulse frequent. The cool and pale state of the cheek, and the rise, as often happens, of the symptoms from diarrhœa, may suggest the hope that the disease depends more upon exhaustion than actual disease within the head. Nourishment, a little brandy, and small doses of carbonate of ammonia, being administered, the eyelids become sensible to the touch of the fingers, the respiration becomes regular, and recovery takes place.[77]

Water in the ventricles is often congenital. In this case, as the child grows, the cranium enlarges to an unnatural size, the mental and sensorial faculties are more or less impaired, and life is rarely prolonged beyond a few years. Amaurosis, with chronic enlargement of the head, the ventricles being distended with water, is a common occurrence. Counter-irritation of the scalp, and tonics internally, are sometimes useful.

§ 23. *Amaurosis from inflammation and dropsy of the brain, consequent to scarlatina.*

This is one of the most remarkable of the hydrocephalic amauroses. It is no uncommon thing for a child, recovering from scarlatina, to be seized, perhaps after some exposure to cold, with headache, followed by frightful dreams, convulsions, blindness, and coma. These symptoms may have been preceded by albuminuria and by the œdema frequently supervening upon scarlatina, and, on that account, are apt to be ascribed to sudden effusion in the brain; but the opinion of Dr. Abercrombie is, I think, undoubtedly correct, that the disease is inflammatory, and that the patient can be saved only by the most vigorous antiphlogistic treatment—blood-letting, purgatives, and the like. By this plan, many cases perfectly recover; some remain ever afterwards liable to epilepsy; others die, and present the usual appearances of inflammatory affections of the brain.

Case 932.—A girl, eight years old, on the morning of the third day of the dropsical disease consequent to scarlatina, complained of headache, which in the course of the same day became extremely violent. In the evening she was seized with convulsions, which, according to the report of her mother, continued 19 hours, with scarcely any intermission. They then ceased, but returned in two hours. In this interval it was discovered that she was blind, and that her pupils were much dilated. The convulsions, after they returned, continued 36 hours; and the patient remained blind eight hours after they left her. This child recovered. Her swellings, which were confined to the face and hands, disappeared while the convulsions were present, but returned after they had ceased.[78]

Case 933.—A boy, 13 years of age, on the morning of the seventh day after his face had begun to swell, was seized with headache; in the evening his limbs were convulsed, and his sight was almost entirely lost. His memory, however, and the faculties of his mind, seemed unimpaired. His convulsions ceased after half an hour; but they returned in an hour, and lasted again about half an hour. In this way he was alternately attacked, and relieved, 11 times in 20 hours. During the convulsions, the external swellings left him, and he complained much of a pain in his belly, increased by pressure. When the convulsions had ceased altogether, his sight became less imperfect; but his countenance was pale, and his pulse feeble and very frequent. The following morning he died.[79]

§ 24. *Amaurosis from morbid formations in the brain.*

Fig. Hooper, Pl. X. XI. XII. XIII. XIV. Dalrymple, Pl. XXXVI. *fig.* 3.

The diseases here referred to are tumours, formed by thickening of the interior membranes of the brain, or by deposition of new matter between their laminæ, or on their surfaces; also tubercles, hydatids or cysts, and fungous growths. The reader will find a good account of the symptoms arising from these various states of disease, in Dr. Abercrombie's Pathological and Practical Researches on Diseases of the Brain. He states, however, that the symptoms are not sufficiently uniform, to enable us to refer them particularly to the several morbid affections in question. Their principal modifications he brings under seven heads; *viz.* 1. Long continued and severe headache, without any other remarkable symptom. 2. After some continuance of fixed headache, affections of the senses, speech, and intellect. 3. Headache, affections of the senses, and convulsions. 4. Convulsions, without any affection of the senses. 5. Paralysis. 6. Prominent symptoms in the digestive organs. 7. Vertigo, and apoplectic attacks. The cases with which Dr. Abercrombie has illustrated these classes of symptoms are highly interesting. It must not, however, be supposed that these classes of symptoms are at all times distinct, and never mix in one and the same case. That much remains to be done in regard to the pathology of morbid formations in the brain, is evident from the fact stated by Dr. Abercrombie, that tumours are sometimes met with in that organ, which have produced no remarkable symptoms, while in other subjects, tumours in the same situation, and of no larger size, have been accompanied by blindness, convulsions, or paralysis.

Beer tells us, that the amaurosis resulting from morbid formations in the brain, generally attacks both eyes at once. The blindness is developed very slowly, not with the sensation of a black cloud, but with *visus defiguratus*, and with indistinctness and confusion in the appearance of all objects. Along with these symptoms there are repeated attacks of giddiness, distressing photopsia, and intolerance of light. The pupil for a time is contracted; the blood-vessels on the surface of the eye turgescent; the motions of the eye and eye-lids at first convulsive, but afterwards palsied, so that the eye is turned immoveably to one side, and the upper eyelid cannot be raised. The pupil now becomes dilated, and vision extinguished. The headache generally goes on increasing, and pain is also felt in the vertebral column. The pain is not uniform in degree, but remits at times, and then increases with such violence that the patient almost loses his reason. There takes place, at last, a permanent disorder both of the remaining external senses and of the mental faculties. Hearing is the first of the remaining external senses which fails; then follows smell or taste, and sometimes both about the same time. At last, the patient loses his memory, and sinks into general insensibility, or becomes maniacal. Hydrocephalus, and an attack of palsy, generally close the scene.

Causes.—Morbid formations in the brain rarely occur except in persons of cachectic constitution. Their exciting causes are blows on the head, fatigue, anxiety, cold, and the like.

Treatment.—In regard to the treatment of amaurosis, attended with symptoms leading us to suspect the existence of some morbid formation in the brain, it is important to observe, that such cases ought by no means to be considered as utterly hopeless. Many cases of this kind have their origin in inflammatory action; and, by proper treatment, we may often impede their progress, prolong the life of the patient, render him more comfortable, and even preserve a certain degree of vision. The treatment will consist in keeping the system low by evacuations and spare diet, in the cautious use of alteratives, cold applications to the head, issues or setons in the neck, and the careful avoidance of all causes of excitement.

Case 934.—Elizabeth Lindup, 19 years of age, of robust make, and general good health, had continued for three years to complain of pain and swimming of her head, increased by motion, and particularly by stooping. These symptoms continued with occasional exacerbations, accompanied by irritation of the stomach, and a suffusion of the eyes such as is produced by crying, till the 22d of April, 1810; when during her occupation of cooking a dinner she was seized without any previous warning with a fit, during which she had no convulsions, but lay motionless, her inspirations being very long and deep, and gradually becoming less so till she recovered. This happened immediately after the completion of the menstrual flux, and lasted some minutes. Mr. Morrah saw her before the fit was quite over, and was particularly struck with the complaint she made of an acute fixed pain of the head, and with the ferrety appearance of the eyes. One month from this time she had another fit, which seized her so unexpectedly, that she dropped with a pan of milk in her hand; and from this time till the 20th of August she had a paroxysm every third week. Each of these paroxysms might be said to consist of two fits—one in the evening, from which she very imperfectly recovered, till after a second, next morning, after which she continued free from any fit for three weeks. On the 20th of August she had three fits in one day, accompanied by a considerable derangement of stomach, and by screaming, and other indications of great suffering, amounting almost to delirium. A succession of these distressing attacks, increasing in severity, and with stupor intervening, continued till the middle of September, when she had nearly lost her hearing. Shortly afterwards she lost the sight of her right eye, and in 14 days more that of her left. Her smell was completely gone, the olfactory nerves being insensible even to the stimulus of hartshorn; her speech and power of deglutition were very much impaired, and her left side, of which she had previously complained as being affected with rigors, became paralytic. On Friday, the 7th of December, she fell into an apoplectic stupor, which continued till the Thursday morning following, during which period she neither spoke nor took nourishment. At that time she roused up, spoke, and swallowed some refreshment, but soon relapsed into the former state; and on Friday evening, the 14th of December, she died. During the whole period, with the exception of October, she menstruated regularly. The pulse, till towards the conclusion, was not affected; there was no increase of heat, the bowels were rather costive, but easily acted upon, and the bladder did its office. At all times, however, the girl laboured under a degree of nervous irritability, unaccountable in a person of such general good health and robust organization.

On dissection the vessels of the dura mater appeared rather more turgid than usual. On removing the dura mater, the pia mater was seen elevated over the right hemisphere by a tumour, which was found to be a hydatid or cyst, about three inches long by two inches broad, imbedded in the substance of the brain, from which it was liberally supplied with minute blood-vessels. The left ventricle contained a little more fluid than is usually found in a healthy subject; the right had hardly any, being compressed by the tumour.[80]

Case 935.—Miss M. A. was afflicted with severe headache in the early part of 1820, being then in her 17th year. She was of a delicate frame, light hair and eyes, fair complexion, and mild and cheerful disposition. She had previously enjoyed good health, menstruated regularly, had not received any blow or injury, and knew of no cause to which her complaint could be assigned. Common means afforded relief, and she went down into Cheshire for four months during the summer, where she was in the habit of taking daily exercise, and on one occasion walked 10 miles without much inconvenience, but was never entirely free from headache. Shortly after her return to town the pain became very distressing, and she again derived benefit from medicines, and the application of a blister to the neck. In January, 1821, in consequence of a severe return of pain, leeches were applied to the forehead; after which she had a long interval of comparative ease. In February she was at a ball, danced for several hours, and appeared to enjoy herself much; nor did she apply for further advice till the 30th of May following. Her symptoms then became rapidly worse, and the pain of the head assumed a more serious character. It was usually referred to the right temple, and she experienced a regular exacerbation every morning to such a degree that in agony she would roll about the bed for an hour or two; after which the pain would gradually subside, and continue tolerable during the day. She was affected with vertigo, occasional syncope, great dread of imaginary objects, a state of high nervous irritation, dulness of hearing, and indistinct vision. She became short-sighted; objects appeared to her larger than natural, and at times she was totally blind for several seconds. She had quickness of pulse, heat of skin, violent pain in the stomach, sickness, and vomiting. Severe pains, unattended with any external appearance of inflammation, attacked in succession various parts of the body; at one time the throat, occasioning an extreme difficulty of deglutition; at another the chest, impeding the respiration; at another different parts of the spine, particularly towards the neck; also the knees, the ancles, and the wrists. Blisters, cold applications to the head, mercury in small doses, not to the extent of salivation, and various other means were tried, but with little or no relief. Her health declined fast, and she became much emaciated from the constant vomiting.

On the 31st of August, 1821, she was attacked, while in bed, with a fit of strong convulsions, attended with strabismus and screaming, which lasted about half an hour, and left her in a state of stupor. Next day she had lost all power over the body, and could not raise herself, or even turn from side to side in bed; her legs and arms she could still move a little; her sight, which, though imperfect, had hitherto enabled her to discern objects, was now so far lost, that she could perceive only the difference between light and darkness. The pupils were much dilated, but still slightly affected by light. Her deafness also was greatly increased. The failure in sight and hearing occurred first on the left side, being the opposite to that in which the pain was originally fixed. The bowels were obstinately costive, the vomiting and pain of stomach continued, the pain of the head was intense, the pulse quick, respiration hurried, skin hot and dry, sleep tranquil and without stertor. In the course of a few days she had a repetition of the same kind of fit, which continued to return with more or less frequency and severity, till within a short period of her death, generally influenced, however, by the state of the alimentary canal. Sometimes she had five or six in a day, and occasionally she would pass several days without any fit. They usually came on without warning; sometimes they appeared to be produced by slight exertion. Besides the general convulsive attacks, she was subject to spasmodic twitchings and startings of different parts of the body. Sight and hearing were soon lost altogether; smell was also entirely lost; and taste, if any remained, was very imperfect. She expressed a desire for particular articles of food, but always complained of their being insipid, and could seldom tell what she was eating.

Being deprived of the use of all the organs of sense, except touch, the only mode of communication that could be devised was the common method of talking with the fingers, the person with whom she was conversing indicating each letter upon the patient's fingers. She was soon able to distinguish by the touch every person with whom she was in the habit of talking, and acquired considerable facility in this mode of conversing, guessing the words before they were half spelled. She would thus keep one or other of her attendants constantly employed when awake. She was anxious to amuse herself with some kind of manual occupation, but her arms were so feeble that she could not bear the fatigue. Her intellect was unimpaired, except when under the influence of the fits. She appeared to be aware of her hopeless condition, and desired that her head might be opened after death. She evinced great patience under her sufferings, and was even cheerful when the pain was moderate. She was seldom, however, when awake, free from intense pain in the head, of a lancinating or throbbing kind, not confined to any particular part. The pain at the upper and lower part of the spine, the sensation of extreme coldness down the back, and the pain in the right, and afterwards in the left breast, were also at times exceedingly distressing. The face was often swelled, and at other times quite shrunk. She rarely complained of cold, excepting down the spine. The cheeks were subject to partial flushings, the heat of skin was frequently oppressive, and the itching at times intolerable. The tongue was occasionally furred, but generally clean. She had no thirst. The appetite, after the vomiting ceased, became almost insatiable, and she recovered flesh. The eyes retained their lustre, but were quite insensible to light, and the pupils fully dilated.

Subsequently she had repeated attacks of bilious vomiting, reducing her each time to a state of extreme debility, from which she as often rallied in a surprising manner. The bowels were obstinately torpid, seldom acting without the aid of cathartics. She once went 14 days without an evacuation. Her symptoms were invariably aggravated when the bowels were constipated. The catamenia ceased to appear, after she was confined to bed. Her respiration was natural and easy; speech unaltered; voice clear and distinct; pulse from 80 to 100, small, and generally weak; sleep very easy and undisturbed, except by her crying out to be turned, after which she would fall asleep again directly. She could not lie on her back, or on either side, but was unable to rest in the same position above half an hour at a time, so that she required some person constantly in attendance to turn her; and if this was not done, as soon as asked for, she often went into a fit. She never recovered the power of her body, nor could she move her head in the least degree; but her sense of touch continued perfect. Several attempts were made to raise her gradually in bed, but they always produced considerable pain, and, if persisted in, brought on a fit. The medicines exhibited were intended merely to relieve her sufferings, except an attempt which was made to affect the system with mercury; but the fits increased so much during its use, that it was discontinued.

The above symptoms continued with more or less urgency till February, 1823, when her powers began to fail altogether, the stomach rejecting every kind of food. No evacuation could be procured from the bowels, without the aid of injections; the whole muscular system seemed to lose its tone; the limbs were drawn into a semiflexed position, and she had scarcely strength to move them; the lips were half closed, the mouth full of aphthous ulcerations, and the teeth covered with sordes; the features were distorted; she slept with her eyelids half open; the eyes became dim; inflammation came on in the left eye, which proceeded to ulceration, and opacity of the cornea. She expressed no pain, and was not even aware that the eye was affected. The urine and fæces were passed involuntarily. She could not swallow any food unless it was reduced to a liquid form, and then only with difficulty. She had a troublesome cough, which, from her extreme debility, frequently threatened suffocation. Pain in the head continued to distress her, but the fits were less frequent, and appeared incapable of producing the same convulsive action, from want of power in the muscles. Her mental faculties also declined; she talked very little, and only of her complaints. Her pulse was so feeble as to be scarcely perceptible. She still breathed freely, and slept much. In September, a slight diarrhœa came on. She could now take scarcely any sustenance, and had become so much emaciated that the skin was excoriated in several places from pressure. She died on the 5th October 1823, having lingered more than two years from the first attack of convulsions, and nearly four years from the commencement of the headache.

The scalp was slightly œdematous. The bones of the cranium were extraordinarily thin, and several short spiculæ projected inwards, from the posterior part of each parietal bone. The membranes covering the brain were free from disease; the substance of the cerebrum rather softer than usual; from eight to ten ounces of fluid in the ventricles; the membrane lining the ventricles of a dingy yellow colour. The thalami nervorum opticorum were somewhat enlarged, and entirely converted into a fungous disease (*Fig.* 131.), which Mr. John Hunter, Jun., the narrator of the case, considers to have been of the nature of fungus hæmatodes. A longitudinal section through one of the thalami presented exactly the appearance of a portion of coagulated blood. The corpora striata were not affected, but the disease extended into the adjacent parts of the cerebrum and cerebellum below, and also to the lower and posterior edge of the falx major. The optic nerves were of a darker colour than usual, but did not appear to be altered in texture. The other cerebral nerves presented no deviation from their natural structure. The spinal marrow, as far as could be traced through the foramen magnum, was perfectly healthy. There were several sharp ridges of bone at the basis of the cranium, and the irregularities were all very strongly marked. No diseased appearance was found in the thorax nor abdomen, except a number of small biliary concretions.[81]

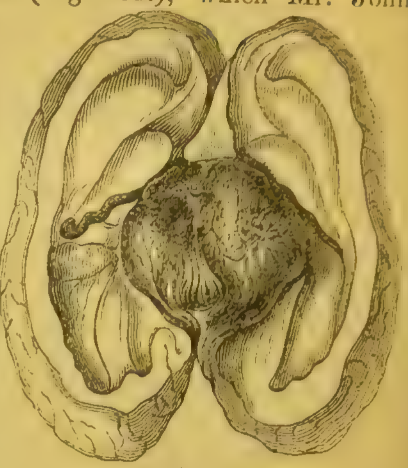

Fig. 131.

§ 25. *Congenital amaurosis.*

Fig. Ammon, Theil III. Taf. XVI. XVII. XVIII.

Infants of a few months have often been brought to me, on account of a suspicion of their being blind. This suspicion is generally founded on the child's being observed neither to follow, nor to be amused by the light of a candle; but this cannot be depended on as a sign of congenital amaurosis, unless it is attended by a rolling motion of the eyes, or by some abnormal form of the head, indicative of defective development of the brain.

In many cases, where the suspicion of blindness was founded merely on defective attraction of the eyes by luminous objects, but in which the pupils were lively, I have known a gradual improvement take place in the course of some months. In some instances, the improvement has been rapid, so that before the end of the first year, vision appeared to be perfect.

Counter-irritation, by small blisters behind the ears, has sometimes been useful in such cases.

Congenital amaurosis, from defective development of some portion of the optic nervous apparatus, must not be confounded with amaurosis arising from injury to the head of the child in instrumental delivery.

Case 936. A little boy, about six years of age, was brought to me from a distance for consultation. I was informed that the mother, after having been in labour for thirty-six hours, was delivered with instruments, by which the child's head, just above the ears, was cut on both sides. During the first four weeks, he took no notice of anything not even of a lighted candle brought close to his eyes. About the end of the fifth week, he began to take a little notice of the candle. This continued for a week or two, when he began to take notice of the day-light. He continued improving till he was six months old, taking notice, however, only of strong light. The improvement went on gradually, the child taking notice of objects held before him, if placed at a certain distance and in a certain position, and holding out his hands towards them, but he never seemed to fix his eyes directly on objects of his own accord. His pupils, when I saw him, dilated and contracted perfectly. He seemed to take more notice of people when in the open air, than when within doors.

[1] Langenbeck, De Retina Observationes Anatomico-pathologicæ, p. 148; Gottingæ, 1836.

[2] Neue Bibliothek für die Chirurgie und Ophthalmologie, Band iv.p.780; Hannover, 1828.

[3] Traité des Maladies des Yeux, p. 702; Paris, 1847.

[4] Dictionaire des Sciences Médicales; Tome xxxv. p. 20; Paris, 1819.

[5] Angiectasie, p. 32; Leipzig, 1808.

[6] Morbid Anatomy of the Human Eye; Vol. ii. Pl. xv. fig. 1; London, 1818.

[7] Notes to Weller's Manual; Vol. ii. p. 79; Glasgow, 1821.

[8] On Injuries of the Brain, in the 14th volume of the Medico-Chirurgical Transactions.

[9] Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; Vol. iii. p. 122; London, 1812.

[10] Ibid. p. 115.

[11] Pathological and Practical Researches on Diseases of the Brain, p. 461; Edinburgh, 1829.

[12] Cruveilhier, Anatomie Pathologique du Corps Humain; 8^{me} livraison, Pl. 3. fig. 1 & 2; Paris, 1830: See case of fibrous tumour of the dura mater, by Liell, Edinburgh Monthly Journal of Medical Science, September, 1850, p. 201: Cases of amaurosis from encephaloid tumour of skull and dura mater, by Stanley, Lancet, 6 May, 1852, p. 238.

[13] Bright, Guy's Hospital Reports; Vol. i. p. 9; London, 1836.

[14] De Morbis Oculorum, p. 75; Gottingæ, 1746.

[15] Commentaries on Insanity, p. 120; London, 1828.

[16] See case reported by I. J. Ikin, Lancet, January 9, 1836, p. 569.

[17] Medical Facts and Observations; Vol. v. p. 97; London, 1794.

[18] Stevenson on Amaurosis, p. iv; London, 1821.

[19] Dublin Journal of Medical Science; Vol. ix. p. 107; Dublin, 1836.

[20] Lee on the Diseases of Women, p. 169; London, 1832.

[21] Op. cit. p. 309.

[22] See case of Jacob Reutinger, who became blind three weeks before a fatal attack of apoplexy, Wepferi Historiæ Apoplecticorum, p. 14; Amstelædami, 1724: Case of recovery from apoplectic amaurosis, Portal sur la Nature et le Traitement de l'Apoplexie, p. 19; Paris, 1811: Case of John Cunningham Saunders, Farre's Life of Saunders, prefixed to a Treatise on some practical points relating to the Diseases of the Eye, p. xix; London, 1811: Case occurring in typhus, Armstrong's Practical Illustrations of Typhus Fever, p. 29; London, 1819.

[23] Observations on the Cataract and Gutta Serena, p. 400; London, 1812.

[24] London Medical Repository for June, 1825 p. 443: See case by Stilling, Ammon's Zeitschrift für die Ophthalmologie; Vol. iii. p. 465; Dresden, 1833.

[25] Medical Gazette, February 7, 1851, p. 253.

[26] Ratio Medendi, Pars 6^{ta}, p. 271; Viennæ, 1763.

[27] Ward, London Medical Repository; Vol xx. p. 217; London, 1823: See Powell, Medical Transactions; Vol. v. p. 223; London, 1815: Rayer, Archives Générales de Médecine; Tome iii. p. 350; Paris, 1823.

[28] Journal de Physiologie; Tome viii. p. 28; Paris, 1828.

[29] Practical Observations in Surgery and Morbid Anatomy, by John Howship, p. 121; London, 1816.

[30] Ibid. p. 119.

[31] Inquiry into the Human Mind, chap. vi. sect. 12.

[32] Larrey, Recueil de Mémoires de Chirurgie, p. 227; Paris, 1821.

[33] Collections from the Unpublished Writings of C. H. Parry, M. D.; Vol. i. p. 561.; London, 1825.

[34] Travers' Synopsis of the Diseases of the Eye, p. 166; London, 1820.

[35] Allan's System of Surgery; Vol. iii. p. 187; Edinburgh, 1824. See case of Diseased Vision, by Mr. Keir, Lancet, 8 October, 1842, p. 60.

[36] Traité sur les Vers Intestinaux, traduit par Grundler, p. 370; Paris, 1824.

[37] Revue Médicale; Tome iv. p. 435; Paris, 1832.

[38] Traité Pratique de l' Amaurose, p. 14. Paris, 1841.

[39] Cours Complet des Maladies des Yeux, p. 378; Paris, 1820.

[40] Edinburgh Medical and Surgical Journal; Vol. xxvi. p. 279; Edinburgh, 1826.

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[42] Traité des Maladies des Yeux, p. 703; Paris, 1847.

[43] Lehre von den Augenkrankheiten; Band ii. p. 444; Wien, 1817.

[44] Osiander's Nachrichten von Wien, p. 76; Tübingen, 1817.

[45] Mémoires de Chirurgie, par J. N. Arrachart, p. 201; Paris, 1805.

[46] Lancet, April 28, 1838, p. 173.

[47] Howship, Op. cit. p. 135.

[48] See case by Burton, Medical Gazette, June 16, 1848, p. 1024: Case in which sulphate of atropia was taken internally, Dublin Medical Press, November 13, 1850, p. 310: Two cases by Tufnell, in which belladonna berries were swallowed; Ibid., January 5, 1853, p. 2.

[49] Fatal Effects of an Over-dose of Stramonium, by Duffin, Medical Gazette; Vol. xv. p. 194.

[50] See cases, by Martin, from digitalis,

Edinburgh Medical and Surgical Journal; Vol. lxi. p. 355; Edinburgh, 1844: Case by Devay, from aconitum napellus, Ibid., p. 496.

[51] Ogston, Edinburgh Medical and Surgical Journal; Vol. xl. p. 277.

[52] Pharmacologia; Vol. ii. p. 451; London, 1825.

[53] Nature and Treatment of Stomach and Renal Diseases, p. 25; London, 1840.

[54] Duplay, Archives Générales de Médecine; 2e Série; Tome v. p. 5; Paris, 1834.

[55] Case of the Effects of Tobacco, by Marshall Hall, M. D.; Edinburgh Medical and Surgical Journal; Vol. xii. p. 11; Edinburgh, 1816.

[56] Zeitschrift für Physiologie; Vol. i. p. 271; Heidelberg, 1824.

[57] Trattato delle principali Malattie degli Occhi; Vol. ii. p 281; Pavia, 1816.

[58] Lancet, November 3, 1838, p. 228.

[59] Abernethy's Surgical Observations on the Constitutional Origin and Treatment of Local Diseases, p. 91; London, 1809.

[60] Such paroxysms as are here described by Mr. Lessey are generally regarded as hysterical. In a female who had long been subject to such fits I found, on dissection, the heart of a remarkably small size. She had been bled exceedingly often in the course of five or six years preceding her death; and perhaps to this circumstance the smallness of the heart might be owing.

[61] Edinburgh Medical and Surgical Journal; Vol. xxv. p. 319; Edinburgh, 1826.

[62] See case, by O'Reilly, from hæmatesis, Lancet, 27 March, 1852, p. 305: Case from loss of blood after phlebotomy, Esquirol, Des Maladies Mentales; Tome i. p. 183; Paris, 1838.

[63] Des Pertes Séminales Involontaires; Paris, 1836.

[64] Edinburgh Medical and Surgical Journal; Vol. xliii. p. 338.

[65] Delpech, Précis élémentaire des Maladies reputées Chirurgicales; Tome iii. p. 238; Paris, 1816.

[66] Arrachart, Op. cit. p. 209.

[67] Caffe, Résumé du Compte-rendu de la Clinique Ophthalmologique de l'Hôtel-Dieu, p. 9; Paris, 1837.

[68] Travers' Synopsis of the Diseases of the Eye, p. 145; London, 1820.

[69] Ibid.

[70] London Medical and Surgical Journal, November 3, 1832, p. 431.

[71] Ware's Observations on the Cataract and Gutta Serena, p. 385; London, 1812.

[72] Guy's Hospital Reports; Vol. iv. p. 1; London, 1839.

[73] Gazette Médicale de Paris, 20 Octobre, 1849, p. 813.

[74] Howship, Op. cit. p. 1.

[75] Archives Générales de Médecine; Tome xxiii. p. 261; Paris, 1830.

[76] London Medical Gazette; Vol. xix. p. 811.

[77] Gooch's Account of some of the most important Diseases peculiar to Women, p. 355; London, 1829: Hall, Medico-chirurgical Transactions; Vol. xxiv. p. 93; London, 1841.

[78] Observations on the Dropsy which succeeds Scarlet Fever, by William Charles Wells, M. D., Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge; Vol. iii. p. 177; London, 1812.

[79] Ibid. p. 178.

[80] Medico-Chirurgical Transactions; Vol. ii. p. 262; London, 1823.

[81] Ibid., Vol. xiii. p. 88; London, 1825. See Case of tumour pressing on the right crus cerebri, right half of pons Varolii, and anterior surface of the right lobe of the cerebellum, producing amblyopia of right eye, and complete amaurosis of left, by Boyer, Archives Générales de Médecine, iie Série; Tome viii. p. 91: Hydatids in the left lateral ventricle, producing distressing photopsia and complete amaurosis, by Johnson, Medico-Chirurgical Review, January, 1836, p. 202: Tumour pressing on corpora quadrigemina, by Kennion, London Medical Gazette; Vol. xxii. p. 894: Tumour in third ventricle, Monro's Morbid Anatomy of the Brain; Vol. i. p. 167; Edinburgh, 1827: Tumour in posterior part of cerebrum, by Bainbridge, Medical Gazette, April 10, 1840, p. 119: Encephaloid disease of brain, Ib.; Vol. xxxix. p. 1004: Tumour in right hemisphere of brain, productive of epilepsy and amaurosis, Medical Times and Gazette, August 13, 1853, p. 166; Tumour below third ventricle, rendering first one and then the other eye amaurotic, and causing deafness, by Heath, Ibid., September 10, 1853, p. 279: Cyst in brain, by Barncastle, Lancet, 12 December, 1846, p. 635: Tumour, like calf's-foot jelly, in brain, Ibid., 29 April, 1848, p. 468: Fungus hæmatodes in brain, Dublin Medical Press, 11 October, 1848, p. 230: Case of amaurosis of one eye, and exophthalmos, by Hibbert Taylor, Medical Gazette, March, 1849, p. 429: Encephaloid tumour at base of brain, by Erichsen, Ibid., Vol. xlv. p. 452: Encephaloid tumour in optic thalamus, Medical Times, 14 December, 1850, p. 622: Tumour of cerebellum, pressing on pons Varolii and fifth nerve, producing amaurosis and paraplegia, by Beith, Medical Gazette, 16 May, 1851, p. 856: Cyst in cerebellum, by Reid, Ibid., 17 October, 1851, p. 664: Tubercular tumour of cerebellum, by Bramwell, Monthly Journal of Medical Science, November, 1851, p. 442: Hyperostosis of cranium, with tumour at basis of brain, and one occupying each meatus auditorius internus, Himly, De Epostosi Cranii rariore, Gottingæ, 1832.

CHAPTER XXVII.

ENTOZOA IN THE ORGAN OF VISION.

PORTAL[1] tells us, that he found hydatids between the choroid and the retina. From so meagre a statement, it is impossible to determine the kind of entozoon which he saw; indeed it is doubtful whether what he calls *hydatids* were entozoa or not.

The following are the entozoa which have been met with in the human organ of vision: —

1. *Echinococcus hominis*, in the areolar tissue of the orbit. 2. *Cysticercus cellulosæ*, in the areolar tissue of the eyelids, under the conjunctiva, in the anterior chamber, and in the cornea. 3. *Filaria Medinensis*, under the conjunctiva. 4. *Filaria oculi humani*, in the crystalline. 5. *Monostoma oculi humani*, in the crystalline. 6. *Distoma oculi humani*, in the crystalline.

§ 1. *Echinococcus hominis.*

The term *hydatid*, which, correctly used, comprehends two or more genera of entozoa, has often been misapplied to common encysted tumours. In the following cases, however, it would appear that a number of echinococci were contained within the cavity of the orbit.

Case 937. — Charles Rowell, aged 42, was admitted into the London Ophthalmic Infirmary, under the care of Mr. Lawrence, on the 3rd January, 1820, with protrusion of the globe from the orbit by a deep-seated tumour, which had been growing for seven years. He had applied at the Infirmary at an earlier period, when the unnatural prominence of the eyeball was distinctly marked, but vision had not become impaired. Mr. L. at that time, felt obscurely, under the superciliary arch, a small, firm protuberance, which seemed part of a deep-seated swelling, and considered extirpation as affording the only chance of relief. The patient was averse to this, and discontinued his attendance. The complaint had slowly increased, its progress having been attended with great pain, which, for some months, had been so severe, both day and night, as to cause great emaciation and general weakness.

When he was admitted into the Infirmary, the tumour had advanced so far between the upper-inner portion of the ball and the eyelid, as to thrust the globe completely out of the orbit. The upper lid, greatly stretched and inflamed, covered the eye and the tumour; the lower lid was completely everted, and its membranous lining appeared as a thick fleshy mass. The conjunctiva of the globe was thickened by chronic inflammation, the consequence of exposure. The structure of the eye was uninjured; the pupil of a middle size, circular and motionless; vision destroyed. The tumour was firm, and apparently fixed to the orbit, affording, on pressure, an obscure sense of fluctuation.

To relieve the distension and pain, and acquire some farther insight into the nature of the disease, a puncture was made into the most prominent part of the swelling, when about a dessert-spoonful of clear watery fluid escaped. Considerable diminution of suffering ensued. When Mr. Lawrence examined the part two days after, he found a soft white substance in the puncture, which, on being removed with a pair of forceps, proved a hydatid. A few others escaped when pressure was made on the swelling. Some more were evacuated next day, and Mr. L. afterwards cleared out the whole collection, amounting to half a teacupful, by enlarging the puncture, and injecting water forcibly into the cavity. The hydatids varied in size, from that of a filbert to that of a small pea. Some were entire, others collapsed. Inflammation and suppuration of the cyst followed, without much pain; the discharge then gradually diminished, and the opening closed in about a month. The eye returned to its natural situation, and all uneasiness ceased. In March, the only traces of the complaint were a loose and wrinkled state of the integuments of the upper lid, and eversion of the lower. A little motion of the iris, and slight perception of light, had returned.

Case 938.—James Walker, aged 20, a sail-maker, was admitted into the Royal London Ophthalmic Hospital, under the care of Mr. Bowman, August 10, 1852, on account of a tumour within the left orbit, which had already produced disorganization of the globe. At its inner and upper parts was a diffused and soft swelling, which yielded to the finger an obscure sense of fluctuation; the conjunctiva of the lower eyelid was everted, and the eye itself dislocated forwards, being directed also somewhat outwards and downwards. The cornea was sunken, flaccid, and half opaque, and the globe partially collapsed. At first sight the appearance was strongly suggestive of the existence of some malignant growth behind the eye, and this idea was confirmed by the pale and sallow complexion of the patient. He stated that three years previously he had first noticed the undue prominence of his left eye, and also about the same time began to suffer a severe aching pain behind it. Both these symptoms had steadily increased, and, without any acute inflammatory affection of the eye, the power of vision had gradually failed until about a year before his admission, when it had become quite extinct. Ever since the commencement of the disease he had suffered much from frontal headache, which had of late quite prevented him from sleeping; it was, indeed, chiefly the severity of this symptom which had induced him to apply for advice. He had been under much medical treatment, but no operative procedure had been adopted.

August 27th. Mr. Bowman determined to make an exploration of the tumour, and chose for examination the somewhat elastic part which was at the upper and inner region, under cover of the upper lid. The lid being raised, he made a puncture with the point of a knife, and immediately a quantity of perfectly pellucid water escaped, and the swelling sensibly diminished. He now immediately enlarged the orifice horizontally, till it was large enough to admit his finger, which he introduced into a large cavity extending down to the apex of the orbit, and having on its sides the textures of that region somewhat thickened and obscured. The optic nerve and some of the recti muscles could, however, be felt, as it were, dissected by the encroachment of the cyst in their interspaces. Search was expressly made for hydatids with the finger, and a scoop was pressed down, but without bringing any into view; and it was concluded that the cyst was a simple aqueous one, surrounded by the tissues altered by its pressure. With the view of obliterating the cyst, a piece of lint was inserted, the end of which projected from the orifice made, and the patient was sent to bed with a poultice over the whole. Considerable swelling followed, and at the end of about a week, suppuration being established, three hydatids appeared in the discharges, two of them being as big as large marbles, and the third about half that size. They were nearly globular, and their walls composed of a thin semi-pellucid membrane.

The swelling of the orbital tissues now gradually subsided, and, at the beginning of October, the parts had resumed nearly their natural dimensions, the remains of the eyeball having sunk down to a level with the margin of the orbit.

Within a few nights after the emptying of the cyst, he began to sleep well, the tensive headache from which he had previously suffered so much being quite removed.[2]

§ 2. *Cysticercus telæ cellulosæ.*

This species of hydatid has been met with,—1. In the areolar tissue of the eyelids; 2. Under the conjunctiva; 3. In the anterior chamber; and 4. In the cornea.

Case 939.—A lad of 14 years of age was brought to me for consultation, with a considerable elevation of the soft parts in the left temple, and dilatation of the zygoma. When one finger was placed within the mouth, and pressure was made with another finger externally, the swelling was perceived to fluctuate obscurely. The antrum was sound. I advised a puncture to be made into the swelling within the mouth. This gave issue to a great number of hydatids, mixed with glairy fluid. Gradually the swelling fell, and also the dilated zygoma. By and bye the left upper eyelid became swollen and red. In fact it suppurated, and on being opened with the lancet, a quantity of pus was discharged, with six or eight cysticerci cellulosæ, about the size of small peas. After this, the young man perfectly recovered.[3]

Case 940.—A little girl of six years of age, was brought to the Bristol Eye Dispensary, with a vesicular tumour, about the size of a pea, beneath the conjunctiva scleroticæ of the right eye, and so near to the inner canthus, that it was entirely concealed from view, except when the eye was turned outwards. It was accompanied by no inflammation, nor productive of any inconvenience. Neither mother nor child knew how long it had existed.

Mr. Estlin opened the tumour with a cataract-knife, and a thin serous fluid escaping, the distended conjunctiva became immediately flaccid. Besides the clear fluid which was let out, Mr. Estlin observed a white flat substance, which he supposed to be a flake of coagulable lymph, or some caseous matter which the tumour had contained; it was, however, of a firm membranous character. On being immersed in water, it expanded, and was seen to be a little bag, which had been opened, and which had attached to it a white, rather solid body, a line and a half in length, and half a line in breadth. The bag itself might be compared, in point of size, with the skin of a very small currant. The more solid portion appeared within the cavity of the bag.

On examining the substance with a lens of an inch focus, it was obvious that it was the cyst of a hydatid, the projecting part being the head and neck of a cysticercus telæ cellulosæ. While viewed in water, the four suctorious discs were observable at the extremity of the head, and when gently compressed between the glasses of an aquatic box, and a higher power employed, the double circle of hooks was also seen. The rugæ in the neck were very conspicuous. The head and neck were covered with minute oval bodies, supposed to be gemmules. On the head they were not very numerous, but the neck was studded with them; they were not only upon the surface, but within the substance of the neck and head. Their size was about $\frac{1}{5000}$ inch. Not one was to be seen in the cystic part of the entozoon. The thick neck, covered with these minute oval bodies, was strongly contrasted with the fine smooth membrane forming the globular part of the entozoon.[4]

The following is the earliest known instance of a cysticercus cellulosæ in the anterior chamber of the human eye. It occurred in the practice of Dr. Schott, and was published by Dr. W. Soemmerring, in Oken's Isis for 1830.

Case 941.—In the left anterior chamber of a healthy girl of 18 years of age, a living cysticercus appeared soon after an ophthalmia; it looked like a little bit of semi-opaque skin, and gradually increased in size. Two months after its first appearance, it caused no pain, but only a slightly disagreeable feeling when it moved briskly; it impeded vision only when it came directly before the pupil; there was a slight redness round the edge of the cornea. The cysticercus generally lay, like a partially dissolved lenticular cataract, at the bottom of the anterior chamber. It appeared as a transparent sphere, presenting only at one spot a milk-white, opaque projection. When the eyelids were gently rubbed, and sometimes spontaneously, the opaque wrinkled portion of the sphere became protuberant, and the slender filiform neck was slowly pushed out. The vesicular body of the hydatid changed, sometimes slowly, sometimes quickly, its spherical form, into one which was broader, oval, or pear-shaped. It commonly lay at the distance of from half a line to a line from the lower edge of the cornea, as the angle between the iris and the cornea was too narrow to contain it. The neck hung down most frequently like a plummet, and swung freely towards every part of the circumference of the cornea, according as the patient's head was moved; seldom did it appear to take hold of any thing.

After remaining for seven months in the eye, and during the last five months acquiring double its previous size, so that it was as large as a pea, a small incision into the cornea was made by Dr. Schott, and the hydatid extracted alive, with Reisinger's hook-forceps. Being put into lukewarm water, it continued to move for more than half an hour. It then became gradually opaque and white, and, with the microscope, the four prominent suckers surrounding the double circle of hooks, and forming the head of the animal, were plainly discerned.[5]

To the kindness of Mr. Meikle, of Edinburgh, I owed the opportunity of examining the case of cysticercus in the anterior chamber, which occurred in the practice of Mr. Logan, and of which he had previously published an account.[6] The patient, a lively, healthy girl, of seven years of age, was present at the Glasgow Eye Infirmary, on the 3d April, 1833, and the accuracy of Mr. Logan's account of the case fully recognised by a great number of medical practitioners.

Case 942. — From the month of August 1832, till about the middle of January 1833, when she was first brought to Mr. Logan, the child had suffered repeated attacks of inflammation in the left eye. Mr. L. found the cornea so nebulous, and the ophthalmia so severe, that he dreaded a total loss of sight. He treated the case as one of scrofulous ophthalmia; and after the use of alterative medicines and the application of a blister behind the ear, the inflammatory symptoms subsided, leaving, however, a slight opacity of the lower part of the cornea. After a week, the child was again brought to Mr. L., who, on examining the eye, discovered, to his great surprise, a semi-transparent body, of about two lines in diameter, floating unattached in the anterior chamber. This body appeared almost perfectly spherical, except that there proceeded from its lower edge a slender process, of a white colour, with a slightly bulbous extremity, not unlike the proboscis of a common fly. This process, Mr. L. observed to be of greater specific gravity than the spherical or cystic portion, so that it always turned into the most depending position. He also remarked that it was projected or elongated from time to time, and again retracted, so as to be completely hid within the cystic portion, while this, in its turn, assumed various changes of form, explicable only on the supposition of the whole constituting a living hydatid.

On the 3d April, when I examined the case, I found the cornea slightly nebulous, the eye free from inflammation and pain, and the appearances and movements of the animal exactly such as described by Mr. Logan.

When the patient kept her head at rest, as she sat before me, in a moderate light, the animal covered the two lower thirds of the pupil. Watching it carefully, its cystic portion was seen to become more or less spherical, and then to assume a flattened form, while at one moment I saw it thrust its head suddenly down to the bottom of the anterior chamber (*Fig.* 132), and at the next draw it up so completely, that it was scarcely visible (*Fig.* 133). Mr. Meikle turned the child's head gently back, and instantly the hydatid revolved through the aqueous humour, so that the head fell to the upper edge of the cornea, now become the more depending part. On the child again leaning forwards, it settled like a little balloon in its former position, preventing the patient from seeing objects directly before her, or below the level of the eye, but permitting the vision of such as were placed above.

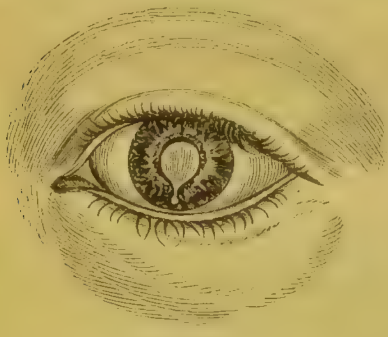
Fig. 132.

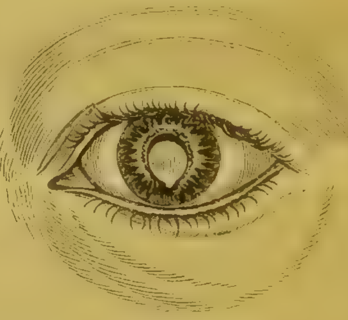
Fig. 133.

Mr. Logan had observed no increase of size in the animal while it was under his inspection. Mr. Meikle had watched it carefully for three weeks, without observing any other change than a slight increase in the opacity of the cystic portion.

To every one who had seen or heard of Mr. Logan's case, the question naturally occurred, Ought not this animal to be removed from the eye? Mr. Logan and Mr. Meikle appeared to have deferred employing any means for destroying or removing it; first, because it seemed to be producing no mischief; and, secondly, because there was a probability that it was a short-lived animal, and likely, therefore, speedily to perish, and shrink away, so as to give no greater irritation than a shred of lenticular capsule. Various means naturally suggested themselves for killing the animal; such as passing electric or galvanic shocks through the eye, rubbing in oil of turpentine round the orbital region, giving this medicine internally in small doses, or putting the child on a course of sulphate of quina, or of some other vegetable bitter known to be inimical to the life of the entozoa. As the patient appeared to be in perfect health, it was natural to suppose that the other organs were free from hydatids, and that change of diet would have little or no effect upon the solitary individual in the aqueous humour. Had she, on the contrary, presented a cachectic constitution, with pale complexion, tumid belly, debility, and fever, none of which symptoms were present, we should have been led to suspect that what was visible in the eye was but a sample of innumerable hydatids in the internal parts of the body, and might have recommended a change of diet, with some hopes of success.

In the course of six weeks after I saw the patient, the cysticercus having enlarged in size, the vessels of the conjunctiva and sclerotica become turgid, the iris changed in colour, and less free in its motions, while the child complained much of pain in the eye, it was decided that the hydatid should be extracted, and I owe to Dr. Robertson, of Edinburgh, who operated, the communication of the following particulars.

The incision of the cornea was performed without the slightest difficulty, but no persuasion or threats could induce the child again to open the eye; she became perfectly unruly, and the muscles compressed the eyeball so powerfully, that the lens was forced out, and the hydatid ruptured. The patient was put to bed in this state. In the evening, Dr. R. succeeded in getting the girl to open the eyelids, when, with the forceps, he extracted from the lips of the incision the remains of the animal in shreds, it being so delicate as scarcely to bear the slightest touch. A portion of the iris remained in the wound, which nothing would induce the girl to allow Dr. R. to attempt to return.

After the eye healed, the cornea remained clear, except at the cicatrice, where it was only semi-transparent; the pupil, in consequence of adhesion to the cicatrice, was elliptical; and the opaque capsule of the lens occupied the pupillary aperture. The patient readily recognised the presence of light.

Case 943.—Elizabeth Gordon, aged 16 years, applied at the Glasgow Eye Infirmary, on the 26th September, 1848, on account of obscurity of vision in her left eye. In the anterior chamber, close in front of the pupil, which, in a bright light, it completely covered, lay a spherical body about $\frac{1}{8}$ inch in diameter, semi-transparent, and having a good deal the appearance, at first view, of the nucleus of the crystalline. On observing it for some little time, it was evident that it was a vesicle, changing occasionally its form and position, and protruding by times from its lower edge an opaque white filament. The part first mentioned was, in fact, the tail-vesicle of a cysticercus cellulosæ, and the latter its body and head. The head was seen to be occasionally thrust down nearly to the bottom of the anterior chamber, and then drawn up completely into the tail-vesicle.

The patient stated, that about the middle of June the left eye had been affected with inflammation, which continued for about three weeks, and was removed after the application of a poultice of rotten apples, immediately after which the hydatid was noticed.

She seemed in good health, but stated that she had never been robust, and when a child, had been troubled with ascarides and lumbrici.

Objects placed in a direct line before the eye, or below it, she saw very indistinctly; but when the light was moderated, the upper part of the pupil expanded past the obstruction of the hydatid, leaving the two lower thirds still covered, and then she saw distinctly objects held above the level of the eye.

From the 1st till the 14th of October, the hydatid was an object of curiosity to numerous medical and other visitors.

Sometimes it was found with its head pointed directly towards the cornea, sometimes with it turned back into the pupil. In both positions, the opaque white colour of the body contrasted strikingly with the semi-pellucid tail-vesicle. I tried to make it revolve in the anterior chamber, by leaning back the patient's head, but did not succeed. Its movements were observed to be most lively in the morning, or when the patient was warm. When the patient became chilled, it moved little, and retracted its body into the tail-vesicle. The extensibility of its body, neck, and four lateral suckers was very great, so that it not only reached completely to the bottom of the anterior chamber, but bent its head to one or other side for a considerable way between the circumference of the iris and that of the cornea.

(Plate II. *fig.* 4.) With a lens of half an inch focus, the suckers were seen elongated and retracted by turns. The rostellum, or middle member of the head, was also distinct, but the corona of claws which surrounds this part could not be made out.

In general, the patient made no complaint of pain. Of the motions of the hydatid she was quite unconscious. Once or twice she complained of pain in the eye; but I attributed this rather to the frequent microscopic examinations to which the eye had been subjected, than to the presence of the cysticercus.

Seeing, however, that vision was so much obstructed by it, and aware that its presence in the eye would ultimately bring on disorganization of the textures with which it was in contact, it was resolved that it should be extracted.

On the 14th of October, the patient lying supine, and her left eyelids being retracted by the fingers of the assistant and the operator, I made a puncture with Beer's pyramidal knife, at the temporal edge of the cornea, to the extent of $\frac{3}{20}$ inch. A little of the aqueous humour escaping as I withdrew the knife, the tail-vesicle of the hydatid became flattened and much expanded between the iris and cornea. I immediately passed Schlagintweit's hook through the wound, seized the body of the hydatid with it, and easily withdrew the animal entire. The iris protruded somewhat through the wound, but was readily reduced by friction through the medium of the upper eyelid, so that the pupil resumed its natural form and place. The patient was sent to-bed, and ordered to keep her eyes shut, and the left eye covered with a wet rag.

The hydatid was received into a teaspoonful of warm blood-serum, but this probably restrained its movements, which grew more lively on its being transferred into tepid water. It continued to move for fully forty minutes after being extracted from the eye, but very feebly for the latter half of that time. Viewed with a compound microscope, the transparent corona of claws surrounding the rostellum was seen distinctly, the claws numbering fourteen. The corpuscles scattered over the neck, and which by some have been taken for ova, were very distinct, as well as the four lateral suckers, which appeared as if covered, each of them, with a minute enchased cornea, darkened with pigment.

The hydatid is preserved in the Anatomical Museum of Glasgow College, and Plate II. *fig.* 6. is a sketch of its appearance magnified about 6 diameters, which I owe to the kindness of Professor Allen Thomson.

Next day, the patient felt quite well; the eye appeared natural, and she said she saw as well with it as the other. No reaction followed, and she was dismissed on the 21st October.

I was led to think it probable, that the attack of ophthalmia in June, immediately preceding the appearance of the hydatid, was owing to the development of its ovum in one of the blood-vessels of the iris or choroid; and that the inflammation ceased suddenly as soon as the hydatid dropped into the anterior chamber, where it lived at its ease, amply furnished with sustenance from the aqueous humour, and unrestrained by any external cyst, such as that which surrounds the same entozoon when lodged among the muscles.

As it was resolved to extract the hydatid by an incision through the cornea, I tried no application to the eye with the view of killing it, such as the vapour of hydrocyanic acid, which, it was suggested, might perhaps have that effect, lest the entozoon, being killed, might excite inflammation, which it had evidently not commenced to do since assuming its place in the aqueous humour; and lest the very means used to dispatch it might cause irritation of the eye, and thereby render the operation more hazardous.

Had the patient been younger and not very staid, I should have put her under the influence of chloroform before proceeding to the operation. The result of Mr. Logan's case, operated on by Dr. Robertson, shows the danger to be apprehended from restlessness of the patient, under similar circumstances.

Case 944.—Samuel Byrne, aged 28 years, a silk-dyer from Macclesfield, was admitted into the Glasgow Eye Infirmary, 22d September, 1850, about a year before which date he had observed his left eye become intolerant of light, and the sight of it to be dim. This was followed, in about a fortnight, by the appearance of an opaque object in the anterior chamber, and this about eight months ago was recognized to be a cysticercus cellulosæ. The eye has never been red nor painful. The hydatid has gradually increased in size, so that the tail-vesicle completely covers the pupil. It is semi-transparent, so that the pupil is seen through it; it is observed changing its figure from time to time. The neck and head are greatly developed, being nearly half an inch long, and fully one-twentieth of an inch thick. The neck is contracted at four or five different points; the head is apparently fixed between the iris and the cornea at their temporal edge. (Plate II. *fig*. 5.) The hydatid prevents the patient from seeing any object with the left eye, which is merely sensible to light and shade.

23d. The cysticercus, and especially its head, more lively. Its lateral suckers distinctly visible with the ophthalmic microscope, and from the centre of the rostellum a minute conical body is seen to be darted and retracted from time to time. The tail-vesicle is covered with white striæ. Says he is not aware of ever having been troubled with worms in childhood. Has been in the way of eating wild rabbits.

27th. In presence of Professor William Thomson, Professor Allen Thomson, Mr. Vaux, of Macclesfield, and a number of other gentlemen, I proceeded to extract the hydatid, as in the last case. Having made a puncture at the temporal edge of the cornea, with Beer's pyramidal knife, I introduced Schlagintweit's hook, and seized the neck of the hydatid close to the head. The hydatid, much more developed, was also much softer than in Gordon's case, for, on attempting to withdraw it, the head broke off. I then seized the neck nearer to the tail-vesicle, and again the neck broke off. Part of the neck projecting from the wound, I seized it with a small forceps, and the remainder of the hydatid, including the whole of the tail-vesicle, readily came away. No protrusion of the iris took place, so that the pupil retained its natural place and size. Strips of court-plaister were applied over the eyelids of both eyes, so as to keep the eyelids from moving.

3d October. He has been up and going about for three days. Eye perfectly well.

The portions of the hydatid were carefully put together by Professor Allen Thomson, and form a preparation in the Anatomical Museum of Glasgow College. Plate II. *fig*. 7. shows the appearance of the head and neck, magnified about 12 diameters.

Case 945.—Mr. Canton has put on record[7] the case of a boy, about ten years of age, in whom a gradual diminution of the vision of one eye having occurred, with a hydrophthalmic state of the anterior chamber, and such haziness of the cornea as completely to obscure the iris from view, the eye being also painful, an opening was made through the most prominent part of the cornea with a cataract-knife, so as to evacuate a small quantity of aqueous humour, along with what was suspected to be the lens and vitreous body, but which turned out, on being examined by Mr. Wharton Jones, to be a large cysticercus. The wound healed readily, and the lad was released from his suffering.

Six or seven months from this period, the boy again applied at the Royal Westminster Ophthalmic Hospital, when the circumstances of the case appeared to require the eye to be again punctured. This was done, when a substance escaped, which some took for a second cysticercus, but which Mr. Canton supposes must have been the lens.

The operation of paracentesis corneæ was performed a third time, by Mr. Guthrie, on account of pain in the eye and around the orbit, when a quantity of vitreous humour only was discharged.

The case appears to have been one in which the presence of a cysticercus not having been recognized in an early stage, the eye was lost from inflammation of the cornea and hydrophthalmia, before the patient applied for relief.

Case 946.—Dr. Appia, of Geneva, has recorded[8] the case of a woman, aged 30 years, who had a cysticercus cellulosæ between the lamellæ of her left cornea. The slow movements of the hydatid could be observed by another person, by means of a magnifying glass. It was lodged in a transparent capsule situated within the lower part of the cornea, and extended upwards a little beyond the edge of the pupil. Its size was that of a small pea. It was so transparent as to produce merely an opaline tinge in the cornea. At one spot a whitish point was discerned, whence the animal pushed out its neck surmounted by a little head. With a strong lens, four openings or suckers were seen symmetrically disposed round the head, and at its extremity a double corona of cilia. The vesicle was seen to change its form, being sometimes oval, sometimes spherical, according as the animal elongated or retracted its neck. Although its size was sensibly increasing, the patient felt no pain from it, nor any particular sensation, except that the field of her vision became a little obscured whenever the animal in its movements came to cover the edge of the pupil.

As the patient, with the naked eye, could give no description of the form of the obstacle, Dr. Appia was curious to try whether she could see it move distinctly with the aid of a lens. He therefore placed a candle on the ground at one of the corners of the room, and held a strong lens before the eye of the patient, seated at the opposite corner. She immediately described the movements of the hydatid, and could tell when, by its successive ascensions and retractions, it obscured the pupil or left it free.

It appears to be pretty well established, that the cysticerci are only imperfect forms of tænia, which, so long as they are in the encysted or confined condition, do not reach their full development. Their ova or embryoes gain, no doubt, their internal situation from without; but how they accomplish their introduction is not fully known. They are very minute, and, being admitted into the body with food or drink, may perhaps be carried through the capillary vessels. In a number of instances, however, the embryoes of small entozoa are known to pierce the tissues of animals with great apparent facility, the circlet of claws with which their head is provided being an organ for that special purpose.[9]

It is worthy of notice, how much oftener the left than the right eye has suffered from the intrusion of cysticerci, either under the conjunctiva or into the interior of the organ; and how frequently the appearance of these entozoa has been preceded either by some slight injury, or by an inflammatory attack.

§ 3. *Filaria Medinensis.*

The filaria Medinensis, dracunculus, or Guinea-worm, a species of entozoon endemic in the tropical regions of Asia and Africa, and generally developed in the sub-cutaneous cellular texture of the lower extremities, and sometimes of the scrotum, has occasionally been met with beneath the conjunctiva.[10]

Case 947. Dr. Loney met with two cases, both patients being natives of Africa, who applied to him with itching, and a sensation as if something was moving about, in the eye. On examination, he observed a worm moving round and round the cornea, beneath the conjunctiva, causing so little irritation that the patients appeared unconscious of the presence of any foreign body. Extraction was performed without any difficulty by snipping off a small portion of the conjunctiva, raised on a tenaculum over the centre of the worm. Neither worm, when extracted, exceeded two inches in length.[11]

§ 4. *Filaria oculi humani.*

The discovery of a species of filaria in the interior of the human eye, we owe to Dr. Nordmann, of Odessa. On examining an opaque crystalline lens, extracted by Gräfe, and partially covered by its capsule, Dr. N. detected in the Morgagnian fluid, two very small and delicate rings, which, with the aid of the microscope, he recognised as convoluted filariæ. One of the two had been wounded in the middle, probably by the instrument used for opening the capsule, so that the intestines protruded from the body, and appeared like fine threads. The other was uninjured, about three-quarters of a line long, and extremely slender. It was spirally convoluted, and completely dead.[12]

In a lens extracted by Dr. Jüngken, Dr. Nordmann afterwards found a living filaria, five lines and a half long.

§§ 5, 6. *Monostoma and Distoma oculi humani.*

In an extracted lens, Dr. Nordmann detected eight minute individuals of the genus monostoma[13]; and Drs. Gescheidt and Ammon, on another occasion, found four of the genus distoma.[14]

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[1] Cours d'Anatomie Médicale; Tome iv. p. 418; Paris, 1803.

[2] Medico-Chirurgical Transactions; Vol. xvii. p. 48; London, 1831.

[3] Medical Times and Gazette, Nov. 6, 1852, p. 465.

[4] London Medical Gazette; Vol. xxii. p. 839. See a second case by Estlin, Ibid.; Vol. xxvi. p. 5: Case by Baum, Annales de l'Oculistique; Tome ii. p. 69; Bruxelles, 1839: By Hoering, Ibid., p. 71: By Cunier, Ibid.; Tome vi. p. 271; Bruxelles, 1842: By Canton, Lancet, April 22, 1848, p. 451: By Bowman, in which the hydatid lay between the external rectus and the lacrymal gland, Medical Times and Gazette, November 6, 1852, p. 466: Cases by Sichel, Archives d'Ophthalmologie, Tome ii. p. 238, Paris, 1854.

[5] Isis, von Oken; 1830; Heft vii. p. 707: Schmalz, Tabulæ Anatomiam Entozoorum illustrantes, p. 11; Dresdæ, 1831: Advertisement appended to Schott's Controverse über die Nerven des Nabelstranges und seiner Gefässe; Frankfurt am Main, 1836: The case published by Neumann (Rust's Magazin für die gesammte Heilkunde; Vol. xxxiii. p. 529; Berlin, 1831) was one of spontaneous dislocation of the lens, and not a hydatid. His figures, as well as his narrative, show this. See Edinburgh Medical and Surgical Journal, January, 1851, p. 120. Alessi (Delle Elmintiasi nelle sue relazioni colla Oculistica, p. 26; Roma, 1850) relates a case as one of hydatid, which seems to have been one rather of effused lymph, as under the influence of calomel and blisters, the substance seen in the eye was absorbed and disappeared.

[6] Case of Animalcule in the eye of a child; by Robert Logan; 1833.

[7] Lancet, July 22, 1848, p. 91.

[8] Archives d'Ophthalmologie; Tome i. p. 58; Paris, 1853.

[9] Consult Thomson, Cyclopædia of Anatomy and Physiology; Suppl. pp. 25, 40; London, 1852, 1854.

[10] Mongin, Journal de Médecine de Paris, 1770; Tome xxxii. p. 338.

[11] Lancet, June 1, 1844, p. 309.

[12] Mikrographische Beiträge zur Naturgeschichte der wirbellosen Thiere; Heft i. p. 7; Berlin, 1832.

[13] Ibid.; Heft ii. p. ix.

[14] Zeitschrift für die Ophthalmologie; Vol. iii. p. 75; Dresden, 1833.: On Entozoa in the eyes of man and other animals, consult Gescheidt, Ibid., p. 405.

FORMULÆ.

I. INTERNAL REMEDIES.

1. *Emeticum Tartratis Antimonii.*

℞ Tartratis Antimonii et Potassæ grana quatuor.

Signa.—Dissolve in a teacupful of water, and give a tea-spoonful every ten minutes till free vomiting is produced.

2. *Pulveres Tartratis Antimonii et Rhei.*

℞ Tartratis Antimonii et Potassæ grana duo ad quatuor,
Pulveris Rhei semidrachmam ad drachmam. Misce, et divide in pulveres sex.

Signa.—One to be taken each night.

3. *Pulveres Disulphatis Quinæ.*

℞ Disulphatis Quinæ,
Amyli, utriusque grana sex ad viginti quatuor.

Misce, terendo in mortario, et divide in pulveres duodecim.

Signa.—One to be given thrice daily.

4. *Pilulæ Calomelanos et Opii.*

℞ Chloridi Hydrargyri mitis grana triginta sex,
Opii desiccati et pulverisati grana novem.

Misce, terendo in mortario, et ope pauxilli aquæ, fiat massa, in pilulas octodecim dividenda.

Signa.— One to be taken every eight hours.

4. *Pilulæ Minerales.*

℞ Arsenici albi grana sex,
Aloes grana nonaginta sex,
Opii desiccati et pulverisati grana viginti quatuor.

Tere simul, adde olei menthæ piperitæ guttas sex, et, ope pauxilli aquæ, fiat massa, in pilulas centum nonaginta duo dividenda.

Signa.—Three pills to be taken daily, one after each meal.

5. *Solutio Persulpho-nitratis Ferri.*

℞ Sulphatis Ferri,
Acidi Nitrici, utriusque drachmas tres.

Tere simul per horæ quadrantem, adde aquæ unciam cum semisse, et cola per chartam.

Signa.— Thrice daily mix from ten to thirty drops in a wine-glassful of water, suck them through a quill, and rinse the mouth immediately afterwards with water.

6. *Solutio Iodidi Potassii.*

℞ Iodidi Potassii semidrachmam ad drachmas duas,
Aquæ uncias duas.
Solve.

Signa.—A teaspoonful to be taken, in a wine-glassful of water, thrice daily.

7. *Tinctura Belladonnæ.*

℞ Extracti Atropæ Belladonnæ unciam,
Alcoholis dilutioris libram.

Digere per dies septem, et cola per chartam.

Signa.—From five to fifteen drops to be taken thrice daily, in a wine-glassful of water.

8. *Tinctura Nucis Vomicæ.*

℞ Seminum Nucis Vomicæ rasorum uncias duas,
Cocci Cacti scrupulum,
Alcoholis dilutioris uncias octo,
Olei volatilis Rorismarini officinalis drachmam.

Digere per dies septem, et cola per chartam.

Signa.—Take from 20 to 40 drops thrice a-day, in a wine-glass of water.

9. *Emulsio Terebinthinæ.*

℞ Olei Terebinthinæ purificati unciam,
Bicarbonatis Sodæ grana quindecim,
Mucilaginis gummi Acaciæ Arabicæ uncias duas.

Misce, diligentur terendo in mortario, et adde gradatim,
Aquæ Cinnamomi uncias tres,
Aquæ unciam,
Syrupi simplicis,
Spiritus Lavendulæ compositi, utriusque semiunciam.

Signa. — Shake the phial, and take a table-spoonful thrice a-day.

II. EXTERNAL REMEDIES.

1. *Collyrium Bichloridi Hydrargyri.*

℞ Bichloridi Hydrargyri granum,
Hydrochloratis Ammoniæ grana sex,
Cocci Cacti, granum cum semisse,
Alcoholis drachmam.

Tere simul, adde aquæ uncias sex, et cola per chartam.

Signa.—Pour out half a table-spoonful of this fluid, and mix it with as much boiling water in a teacup previously warmed. With a piece of old linen, or soft sponge, bathe the eyelids with the mixture, for a few minutes; and then, by leaning back the head, allow a little of it to flow in upon the eye. Repeat this thrice a-day.

2. *Collyrium Bichloridi Hydrargyri cum Belladonna, vel Collyrium Compositum.*

℞ Bichloridi Hydrargyri granum,
Hydrochloratis Ammonia, grana sex,
Extracti Atropæ Belladonnæ grana decem,
Cocci cacti granum cum semisse,
Alcoholis, ʒj.

Tere simul, adde aquæ uncias sex, et cola per chartam.

Signa.—As for No. 1.

3. *Collyrium Belladonnæ vel Atropiæ.*

℞ Tincturæ Belladonnæ drachmam ad drachmas duas, vel Atropiæ semigranum ad granum,
Aquæ, uncias sex.
Misce.

Signa.—As for No. 1.

4. *Collyrium Frigidum.*

℞ Aceti Aromatici guttas quinque,
Spiritus Ætheris Nitrici drachmam,
Aquæ uncias quinque et drachmas septem.
Misce.

Signa.—Pour out half a wine-glassful of this fluid; with a small piece of clean soft sponge dipped in it, and gently wrung, bathe the eyelids, side of the nose, eyebrow, forehead and temple, for a few minutes; and then allow those parts to dry of themselves. Repeat this three or four times daily, or as often as the eyes feel painful, hot, or weak on exposure to light. The fluid does not require to go in on the eye.

5. *Solutio Nitratis Argenti.*

℞ Nitratis Argenti granas duo ad decem,
Aquæ distillatæ unciam.

Solve, et cum solutione mitte penicillum parvum.

Signa.—Pour ten or twelve drops out of the phial into a clean wine-glass. Wash the brush with a little cold water, and wring it gently; dip it into the wine-glass so as to take up the drops; open the eye and touch the inside of the lower eyelid with the brush, so as to let the drops flow in upon the eye. Wash the brush, and keep the phial close-corked and standing on end, till the next time the drops are to be used. The drops are to be used once a-day, or oftener, if so directed.

6. *Collyrium Alkalinum.*

℞ Aquæ Potassæ semidrachmam ad drachmas duas,
Tincturæ Catechu scrupulum,
Aquæ uncias sex.

Signa.—To be used as a solution for bathing the eye, thrice a-day. Or,

To be used as an injection into the lacrymal passages.

7. *Solutio Lapidis Divini.*

℞ Æruginis,
Nitri puri,
Aluminis, utriusque pulverisati uncias tres.

Liquefiant in vase vitreo super arenam calidam.

Liquefactis adde Camphoræ tritæ drachmam cum semisse. Misce. Massa refrigerata servetur sub nomine Lapidis Divini.

℞ Lapidis Divini grana decem ad viginti,
Aquæ Distillatæ semiunciam.
Solve et cola.

Colaturæ adde Vini Opii drachmam ad drachmas duas,
Aquæ Rosarum uncias quatuor.
Misce.

Signa.—To be used as a lotion for bathing the eye thrice a-day, Or,

To be used as an injection into the lacrymal sac.

8. *Solutio Belladonnæ Aquosa.*

℞ Extracti Atropæ Belladonnæ grana decem ad viginti,
Aquæ unciam.

Tere simul in mortario, et cola per chartam.

Signa.—As for No. 5.

9. *Solutio Acetatis Atropiæ.*

℞ Atropiæ granum,
Acidi Acetici diluti guttas quinque,
Aquæ semiunciam.
Misce.

Signa.—As for No. 5.

10. *Unguentum Præcipitati Rubri.*

℞ Hydrargyri Præcipitati Rubri, grana decem ad triginta.

Tere in mortario in pulverem subtilissimum.

Adde Axungiæ unciam. Misce, et fiat unguentum.

Signa.—[*In Catarrhal Ophthalmia.*] On going to bed, melt on the end of the finger about the bulk of a barley-corn of the salve, and anoint with it the edges of the eyelids.

[*In Opacity of the Cornea.*] Having melted about the bulk of a barley-corn of the salve on the end of the finger, introduce it between the eyelids, and, if possible, beneath the upper eyelid. Then rub gently, for about half a minute, the upper eyelid over the eyeball, so that the salve is applied to the speck. Repeat this each night at bedtime.

[*In Ophthalmia Tarsi.*] Having carefully bathed the eyelids, and removed with the finger-nail any matter which may be sticking to their edges or the eyelashes, melt about the bulk of a barley-corn of the salve on the end of the finger, and rub it well into the roots of the eye-lashes, and along the edges of the eyelids. Repeat this every night at bedtime.

11. *Extractum Belladonnæ.*

℞ Extracti Atropæ Belladonnæ, drachmas duas.

Mitte cum extracto penicillum modicum.

Signa. — Having fomented the eye for ten minutes with a piece of flannel wrung out of hot water, dip the brush in water, and with this moisten the extract till it becomes like thick paint; then paint it upon the eyebrow and outside of the eyelids morning and evening.

12. *Emplastrum Antimoniale.*

Inducatur linteum idoneæ formæ et amplitudinis emplastro resinoso. Dein irroretur oleo tiglii crotonis, margine excepto. Postea saturetur oleum pulvere antimonii tartarsati.

Signa.—Warm the plaster, apply it to the part indicated (behind the ear, to the temple, &c.), keep it on for three days, then remove it; apply a poultice of bread and water for twenty-four hours, and afterwards dress the part morning and evening with lard or resinous ointment.

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